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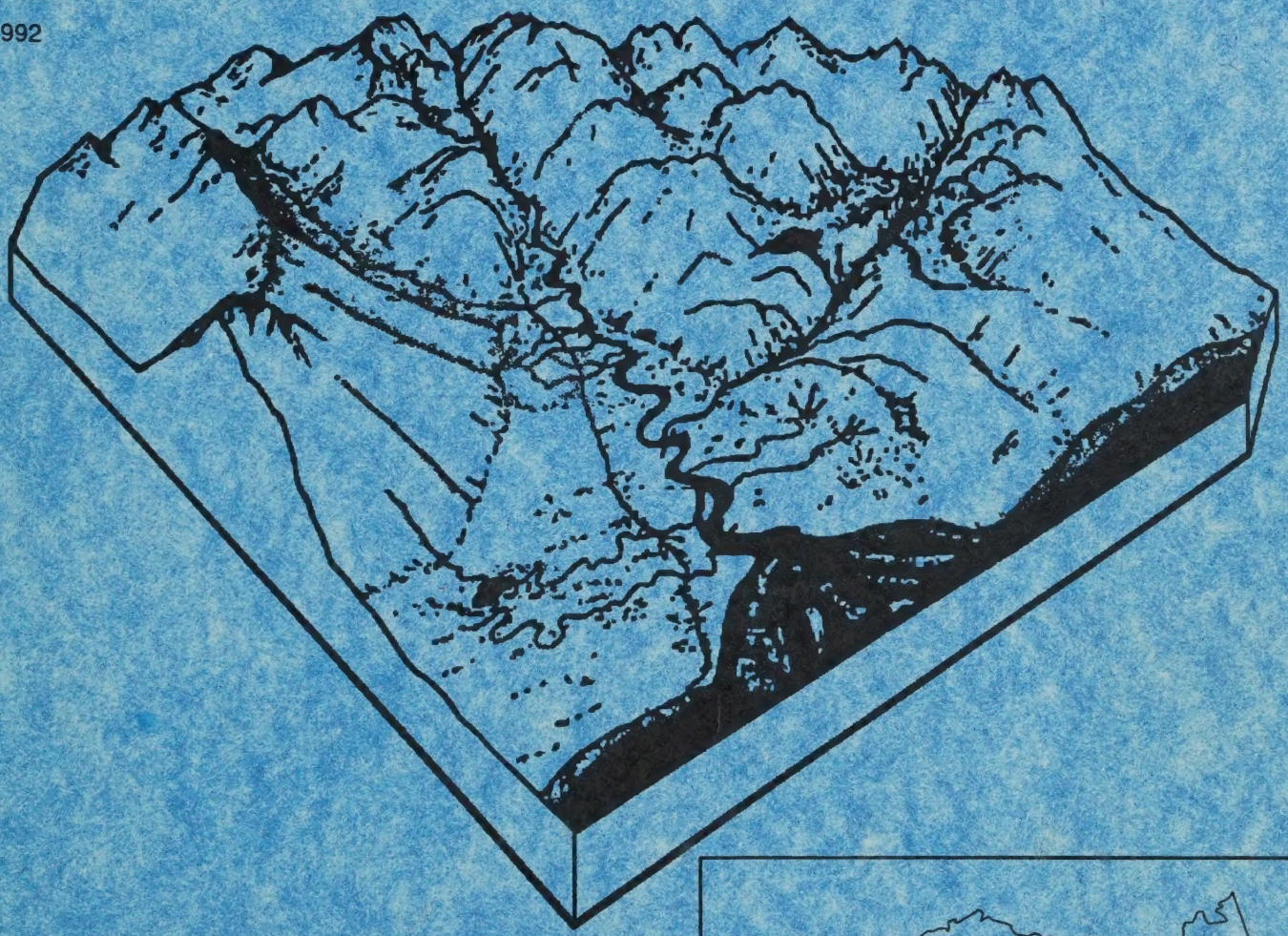
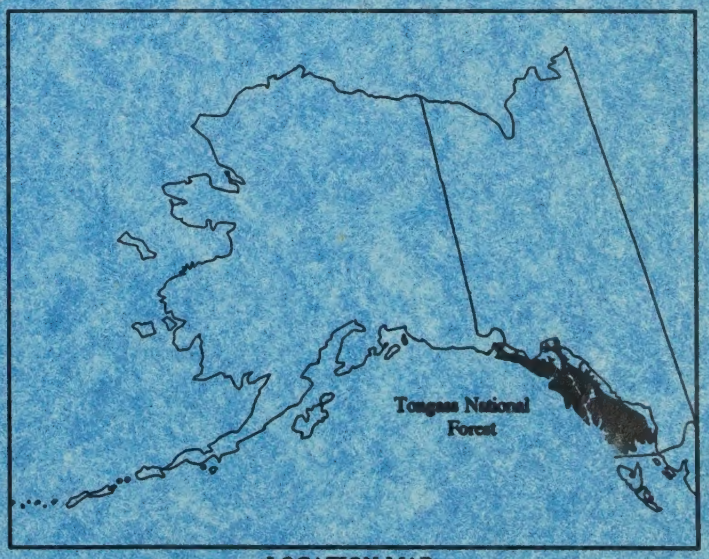
CHANNEL TYPE USER GUIDE

Tongass National Forest
Southeast Alaska

April 1992





LOCATION MAP

TYPICAL DISTRIBUTION OF CHANNEL PROCESS GROUPS WITHIN ALEXANDER ARCHIPELAGO WATERSHEDS

A CHANNEL TYPE USERS GUIDE

for the Tongass National Forest, Southeast Alaska
USDA Forest Service, Alaska Region

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Contributors: Steve J. Paustian (Editor), Kimberly Anderson, Dave Blanchet, Steve Brady, Michael Cropley, John Edgington, Jenny Fryxell, Gail Johnejack, Dan Kelliher, Mike Kuehn, Scott Maki, Robert Olson, Jane Seesz, and Mike Wolanek.

Dedicated to the memory of Jim Downs, Soil Scientist.

Jim helped pioneer the application of integrated resource inventories in the Alaska Region.

ACKNOWLEDGEMENTS

The following individuals have made significant contributions to the development and implementation of the Alaska Region Channel Type Classification System: Craig Burns, Jim Cariello, Dave Gibbons, Charlie Holstein, Steve Kessler, Dan Logan, Steve Lyons, Dan Marion, Mike McCorison, Doug Perkinson, Ann Puffer, Scott Russell, and Steve Zemke.

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Thorough reviews by Dan Marion and John Thedinga greatly improved the final manuscript.

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User Guide Purpose

This User Guide is intended for forest resource planners, fisheries biologists, hydrologists, ecologists, or anyone involved with water resource management on the Tongass National Forest. It describes a stream classification system based on mapped stream reaches called channel types. Since channel type mapping is a principal tool for managing aquatic and riparian resources of the Tongass National Forest, it is important that everyone involved with water and fisheries management in Southeast Alaska be familiar with this stream classification system.

The purpose of this User Guide is to provide users with sufficient information to understand the characteristics of each channel type and to know what should be considered when planning activities that may affect water and fisheries resources associated with each one. Channel types are being used for planning, implementing, and monitoring forest land management activities on the entire Tongass National Forest. In addition, most state and Native Corporation Land in Southeast Alaska has been mapped. Preliminary channel type mapping and stream inventory work is currently underway on the Chugach Forest in south central Alaska.

What Are Channel Types?

Components of the Alaska Region Channel Type Classification System are defined within the context of nine basic **fluvial process groups**. These process groups describe the interrelationship between watershed runoff, landform relief, geology, and glacial or tidal influences on fluvial erosion and deposition processes.

Individual channel type classification units within each process group are defined by physical attributes, such as channel gradient, channel pattern, stream bank incision and containment, and riparian plant community composition. Channel types are a means of distinguishing the various parts of a stream system. They allow us to define the characteristics of the channel and to predict, with a high degree of accuracy, probable responses to natural and human influences. However, channel types cannot be managed as isolated segments. Stream reach in one part of a watershed can be affected by activities taking place in a different part of the watershed, either upstream, downstream, or on adjacent land areas. Channel types help define the parts of a drainage basin and, as such, are tools intended to complement a holistic watershed management approach. It is important to remember this concept when using this guide.

Applications

The Channel Type Clasification System was developed with water resource management needs in mind. Propagation of anadromous fisheries is the major beneficial use of water resources in Southeast Alaska. Channel type inventories provide key information on fish habitat utilization, fish habitat capability, and fisheries enhancement options in survey area watersheds. Channel types also provide information on suitable stream crossing locations and design criteria for road drainage structures. Channel types are used to evaluate potential sediment delivery and retention for cumulative watershed effects analysis. Information on sport fishing potential and boat access is also included in the channel type descriptions.

The channel type mapping process involves three major steps. Initial mapping units are defined through interpretation of 1:15840 (4 in. = 1 mi) aerial photographs. Field verification of channel type mapping units, using low level air reconnaissance and on-the-ground spot checks is the next step. Finally, photo mapping is transferred to mylar topographic base maps (usually 2 in. = 1 mi scale) and then digitized, for incorporation into the ArcInfo, Geographic Information System (GIS). A corollary stream inventory data base that includes channel morphology data, fish habitat data, and information on riparian plant community composition also resides at the Watershed and Fisheries Staff Group in the Chatham, Stikine, and Ketchikan Area Forest Supervisor's Offices.

Channel type mapping of State and Native Lands is currently on hard copy base maps. These maps and field verification data are maintained by the Alaska Department of Fish and Game, Commercial Fisheries Division, in Juneau.

Things To Be Aware Of

The information contained in this user guide is intentionally brief. The purpose is to give a picture of channel type characteristics and management concerns. Anyone seeking additional information should consult area hydrologists or fisheries biologists, as well as the sources listed in the References. Every attempt has been made to simplify technical terms to make this guide useful to a variety of people. However, since not all technical terms can be simplified, a glossary is provided.

The information provided in this user guide refers to typical channel type conditions, and is intended to summarize those conditions that most frequently represent the range of channel type characteristics found throughout Southeast Alaska. Although channel type characteristics are relatively consistent, a degree of variability is inherent in these map units. Therefore, caution should be used in relying solely upon this information for site-specific project decisions. An individual channel type is not necessarily invalid if actual stream characteristics, such as channel width, are outside the range of values reported in this user guide. Site-specific channel characteristics and management interpretations should be verified in the field, as necessary, for project planning.

Channel type mapping should play a prominent role in setting priorities for any field verification. Not all streams are mapped in the Channel Type Inventory. These unmapped streams are predominantly very small (1 meter wide), mountainslope, wetland, and flood plain drainage features. This mapping limitation is due to the scale of aerial photography used and because vegetation canopy obscures most small streams. In general, these unmapped streams have little management significance. Exceptions are unmapped flood plain and wetland drainages that often have important seasonal fish habitat. Users should refer to soils or landtype mapping unit descriptions for information on the distribution and frequency of the unmapped streams in a given geographic area. Where apparent mapping discrepancies occur, users are requested to consult with Area Hydrologists or Fisheries Biologists.

The channel type information contained in this user guide is the result of many years of development, modification, and validation. Nevertheless, the Channel Type Classification System will continue to evolve as new applications are developed and as additional resource data is compiled. The Tongass National Forest Supervisor's Offices, in a coordinated effort, will issue updates to this user guide whenever the need arises.

This User Guide contains brief information for each of the 38 channel types currently mapped on the Tongass National Forest. There is a separate section, consisting of three parts, **TITLE, PHYSICAL CHARACTERISTICS, and MANAGEMENT CONSIDERATIONS**, for each channel type. Data used to describe the channel structure, riparian vegetation, and aquatic habitat has been obtained from channel typing verification and stream inventories conducted on watersheds throughout Southeast Alaska.

TITLE

Each section begins with the naming convention which includes the channel type name and the process group name. The channel mapping symbol is commonly used as the shorthand name for a given channel type.

Process Group Name. Various channels bear the signatures of the processes that formed them. Channels formed and maintained by the same or similar fluvial processes are grouped for taxonomic purposes. Process groups reflect the long term interaction of geology, landform, climate, and riparian vegetation. Process groups characterize the basic interrelationships between the runoff, sediment transport, and vegetation patterns along stream banks. Forest Plan Management guidelines and practices developed for each process group will consistently address the various management concerns for distinct channel types.

Channel Type Name. Within each process group are a number of channel types which further define differences and describe individual channels. Channel type names are similar to *species* in a biologic taxonomy or to *series* in a soils taxonomy. Channel types have less variable characteristics than the process group level of the hierarchy. This allows for more site-specific analysis and prescriptions for project level plans. Some channel types may have one or more phases, or common variants, which influence management interpretations. These are similar to biological *varieties* of species.

Mapping Symbol. Mapping symbols are assigned to each channel type and are often used as a shorthand means of identification. The mapping symbol legend is connotative so that the user can easily identify the process group and the general relationship between channel types in each one. The first two alpha characters are an abbreviation for the process group name (e.g. FP = Flood Plain Process Group). The first digit represents a distinct channel type unit. The channel type numbering sequence is designed to identify key physical criteria that help distinguish channel types within a given process group. For example, FP1 channel types have low stream gradient and fine bed substrate, whereas FP4 channel types have higher gradient and large substrate relative to other channel types in this particular process group. This connotative legend was recently developed, therefore, the old mapping symbol is placed in parentheses to assist those who have worked with the system prior to 1991.

Immediately beneath the channel type name(s) given at the beginning of each section is a figure that aids in understanding the process group and channel type being discussed. This block diagram illustrates typically associated landform and channel type morphology.

PHYSICAL CHARACTERISTICS

The Physical Characteristics section presents quantitative data for and qualitative descriptions of each channel type.

Geographic Setting. This subsection is a short description of landforms commonly associated with the channel type. It describes the typical size of the drainage basin and discusses features unique to the channel. Mapping symbols of similar channel types are listed.

Immediately following the Geographic Setting description are two figures. The first is a cross-sectional profile of the channel and its adjacent sideslopes. The second is an actual in-stream photo. Both represent average characteristics for the given channel type in Southeast Alaska.

Similar Channel Types. This is a list of channel type map units that have similar mapping criteria and differentia to the channel type being described.

Channel Structure. Quantitative geomorphic data from the Tongass National Forest Channel Type Database is included here. Mean values and percentages are calculated for all surveyed channels in the database. (See Chapter 20 of the R-10 Soil and Water Conservation Handbook [FSH 2509.22] for detailed explanation of data collection methodologies.)

Composite Channel Cross-Section. Channel cross-section schematics are based on a compilation of channel and sideslope profiles. Key morphologic characteristics shown in the diagram are mean values. The symbols in the diagram are defined as follows: **ID**=Channel Incision Depth, **Wbf**=Width Bankfull, **Bfs**=Bankfull Water Surface, **SS**=Sideslope Angle.

Gradient. Gradient refers to the slope of the water surface profile. It is usually measured using a clinometer and stadia rod over two riffle-pool sequences.

Incision Depth . Incision depth is the vertical distance between the first major slope break above bankfull stage and the channel bottom at the thalweg. It is measured using a visual estimate verified by a transect of the sideslope perpendicular to the stream.

Bankfull Channel Width. Bankfull width is the distance from bank to bank when the stream stage is considered to be "bankfull" or at the most active channel forming stage (may be considered to be a two year flood event). Bankfull width is generally measured using a surveyor's tape strung across a channel perpendicular to its banks.

Substrate. Substrate refers to the surface stream bed material composing the channel bottom and lower banks. It is measured using an ocular, boot-tip transect. The dominant size classes for each channel type are presented.

Bank Composition. Bank composition refers to the dominant stream bank material. Three bank composition categories are used - alluvium, bedrock, and mixed. Alluvial channel banks are composed of unconsolidated, fluvial, sediment particles with very infrequent bedrock occurrence (less than 2% bedrock along the channel segment). Bedrock channels have extensive bedrock outcropping along stream banks and stream bed (bedrocks occur along more than 15% of the stream segment). Mixed implies a combination of unconsolidated particles and bedrock material, where bedrock occurrences are consistent but not extensive (2-15% of the stream segment). Bank composition is determined from field surveys along a sample channel type segment.

Sideslope Length and Sideslope Angle. The landform immediately adjacent to the channel is characterized by sideslope length and angle measurements. These landform values are measured along the slope distance in the field using a clinometer and hip-chain along a 61 meter (200 feet) transect perpendicular to a representative portion of sample channel type. These parameters are not described for some flood plain and low relief riparian landforms.

Channel Pattern. The channel pattern is described as single, multiple, braided, or some combination of these categories. Channel sinuosity may also be described. Channel pattern is determined from aerial photography and verified in the field.

Basin Size. When appropriate, a range of the basin sizes associated with sample stream segments is listed.

Riparian Vegetation. Immediately preceding this subsection is a table showing the distribution of plant associations along the channel type within about 61 meters (slope) of the channel. These plant associations were inventoried in the same location as the sideslope profile transects. Data represents a weighted mean of canopy cover for each plant association occurring along the transect. The text and a table summarize the dominant plant association series and nonforested plant communities in the 61 meter riparian zone. The location of the most common plant communities with respect to the channel edge is also discussed. Note that these percentages reflect Tongass-wide data and may not reflect riparian plant communities representative of your local area.

Plant Association Series. This is a listing of major Forest plant series defined by the R-10 Plant Association Classification.

Channel Type Phases. This subsection provides a listing of phases that have been accepted for use with channel types on the Tongass National Forest. Phases may be considered variants or subspecies within the channel type, and are identified by the addition of a lower case letter immediately following the numeric digit of the channel type mapping symbol (e.g. FP2f). They are defined where taxon class limits are too wide for needed interpretations, or where some feature, such as adjacent riparian plant community structure, has significance for management. For further discussion on phases, refer to the appropriate section of Chapter 20 of the R-10 Soil and Water Conservation Handbook (FSH 2509.22).

MANAGEMENT CONSIDERATIONS

This section presents quantitative data for and qualitative descriptions of channel type characteristics that are pertinent to aquatic and riparian resource management. Channel type data and interpretations for various land management planning activities are summarized in this section, which is divided into three subsections, **Hydrologic Function, Aquatic Habitat Capability, and Riparian Management Considerations**.

Hydrologic Function. The hydrologic function of a channel refers to its typical flow characteristics (average as well as range), and, therefore, its ability to function in sediment routing. This discussion provides a qualitative assessment of whether a channel type best serves the erosion, transport, or deposition (storage) phase of sediment transport in a stream network. Relative stream energy or power describes the bedload transport capability of a channel type. It also includes relevant discussion on sediment sources, and the role of large woody debris on channel structure.

Aquatic Habitat Capability. This subsection contains a summary of key stream inventory data relevant to fish habitat capability, including available spawning area (ASA), available rearing area (ARA), and large woody debris (LWD) volume. A tabular summary of qualitative ratings for spawning and rearing habitat capability for key (Management Indicator Species - MIS) fish species is also listed. These ratings (LOW, MODERATE, HIGH) are based on a combination of habitat inventory data, fish population sampling, and the professional judgement of fisheries biologists and hydrologists having extensive knowledge of Southeast Alaska stream habitat and fisheries. A rating of NEGLIGIBLE (NEG) is used when the species of concern is not likely to utilize the channel type for spawning or rearing habitat. These ratings are meant to portray a very general picture of the potential quality of fish habitat associated

with a given channel type. The narrative following this table further describes various habitat characteristics, including spawning habitat distribution, the type and distribution of large woody debris habitat, pool characteristics, overwintering habitat, stream bank cover, and other important habitat features that are typical for that channel type. (Refer to FSH [FSH 2609.24 and FSH 2509.22] for more detailed discussion on aquatic habitat capability.)

Riparian Management Considerations. This subsection presents management concerns for instream and near-stream management activities, as well as a consideration of riparian management opportunities.

Management Concerns presents a rating (LOW, MODERATE, or HIGH) of the sensitivity of channel types to timber harvest and road building activities. A LOW sensitivity rating indicates a low probability that special mitigation measures for management activities are necessary to meet water quality and fish habitat protection objectives. MODERATE sensitivity indicates that some management limitations are associated with the channel type. Site specific mitigation measures may need to be considered. HIGH sensitivity indicates that site specific management prescriptions to protect water quality, fisheries, and riparian resources are usually needed. (N/A for not applicable is used when the particular concern does not apply.) Six general categories of concerns for management are considered. These include **Large Woody Debris, Sediment Retention, Stream Bank Sensitivity, Sideslope Sensitivity, Flood Plain Protection, and Culvert Fish Passage**.

Large Woody Debris. This concern deals with the need to provide long-term sources of large wood critical for maintaining stream channel structure and habitat diversity. The size, quantity, and distribution of natural large woody debris are primary factors considered in this rating.

Sediment Retention. This is a key water quality concern related to the potential for retention of fine sediments (sand particles or smaller) in spawning beds. Relative stream power is the primary factor considered in this rating.

Stream Bank Sensitivity. Stream bank sensitivity rates the potential for management disturbance associated with timber harvest or road crossings to contribute to accelerated stream bank erosion. Natural stream bank composition and channel stability factors are considered in this rating.

Sideslope Sensitivity. This rating deals with the potential for mass wasting erosion and sediment delivery resulting from disturbance of sideslopes associated with well contained channel types. Natural sideslope length and angle, and natural mass wasting potential are the primary factors considered.

Flood Plain Protection. This rating deals with the concern for maintaining riparian flood plain and wetland functions and long-term stability. Riparian habitat extent and diversity are the principal factors considered.

Culvert/Fish Passage. Fish passage concerns relate to the requirement that unrestricted migration of juvenile and adult salmonids be maintained through crossing structures on Value Class I streams. Stream class, peak stream discharge, stream gradient, debris and bedload transport potential are factors considered in rating culvert passage concerns for a given channel type.

BEST MANAGEMENT PRACTICES (BMPs)

A narrative elaborating principal riparian management concerns follows this rating table. Key Best Management Practices (BMPs) designed to protect water quality and beneficial uses, such as fisheries, wetland, and riparian habitats, are also referenced in this subsection (see Chapter 10 of FSH 2509.22). The BMPs referred to in this discussion are meant to provide guidance for development of site-specific riparian management prescriptions. However, this listing of pertinent BMPs should not be considered all inclusive, as additional BMPs will most likely need to be incorporated into individual management prescriptions.

Typical Stream Value Class. The typical stream value classes are also listed in this subsection. Stream class for a specific stream map unit should be adjusted based on site specific criteria when available.

Stream class for each channel type is indicated as Class I, II or III, depending on the fish use of the streams. These define AHMUs (Aquatic Habitat Management Units) in the Aquatic Habitat Management Handbook, FSH 2609.24. These stream classifications are defined as follows:

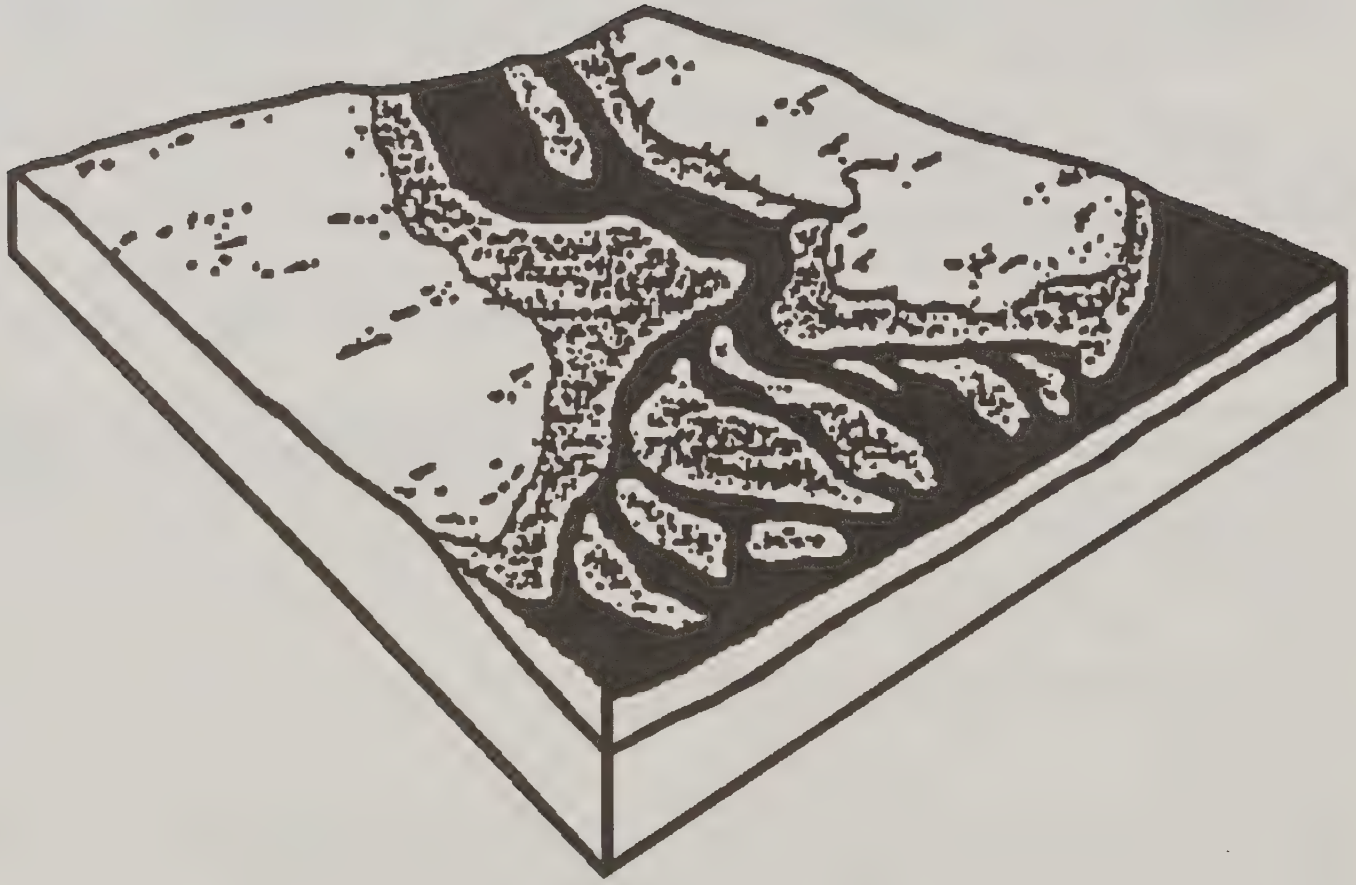
> **Class I**: Streams with anadromous (fish ascending from oceans to breed in fresh water) or adfluvial (fish ascending from fresh water lakes to breed in streams) lake and stream habitat. Also included are the habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations.
>
> **Class II**: Streams with resident fish populations and generally steep (often 6-15 percent) gradient (can also include streams from 0-5 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values. These streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.
>
> **Class III**: Streams with no fish populations but which have potential water quality influence on the downstream aquatic habitat.

Riparian Management Opportunities. This section discusses recreational sport fishing potential and various other enhancement opportunities.

Sport Fish Potential. Rates the relative potential (LOW, MODERATE, HIGH) for developing or enhancing a sport fishery on the typical channel type.

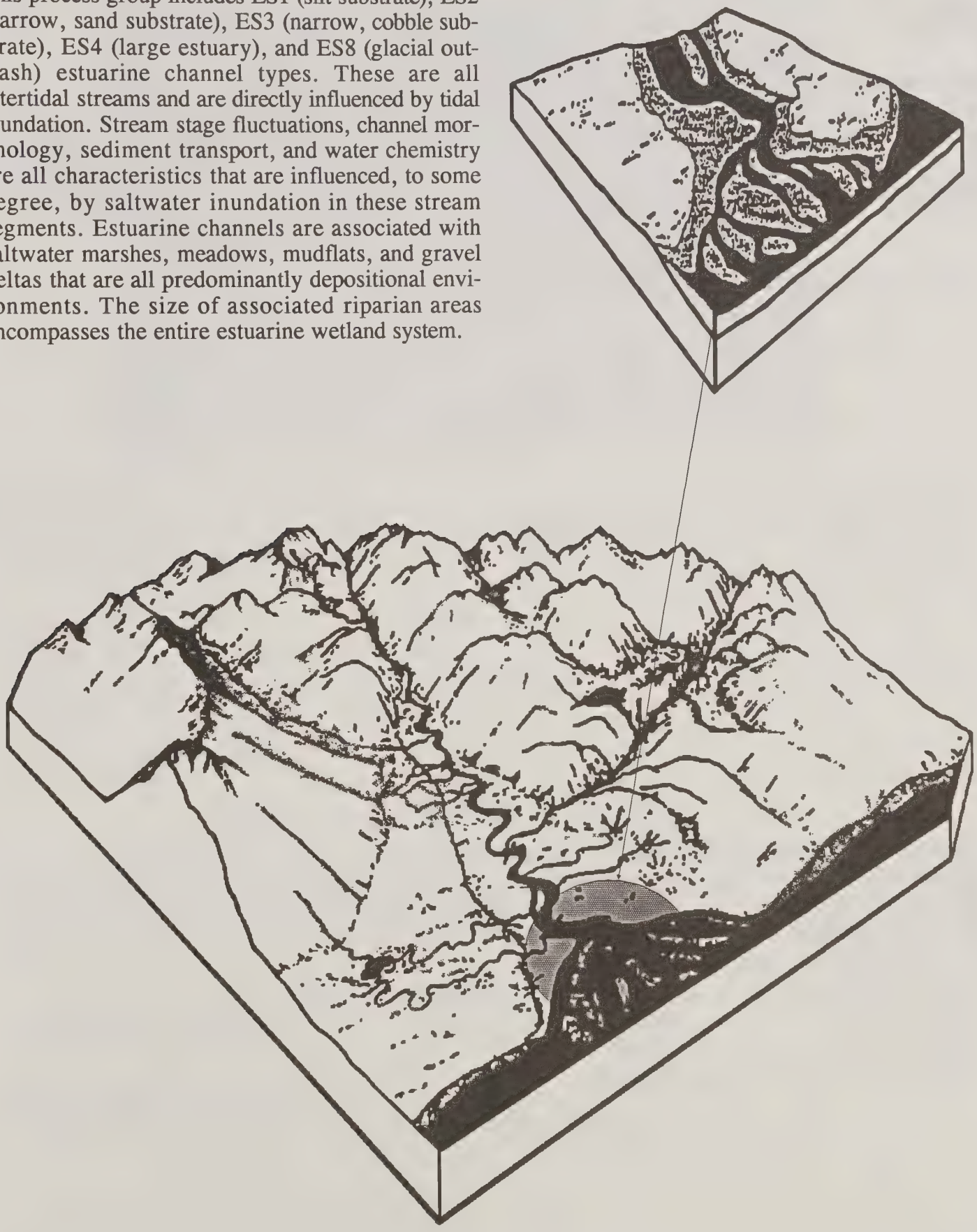
Enhancement Opportunities. Lists several habitat enhancement opportunities that may be feasible on a site-specific basis for a given channel type. Enhancement opportunities considered include large wood placement, fry stocking upstream of removed fish barriers, development of off-channel spawning beds, and introduction of beavers to improve rearing habitat.

Estuarine Process Group



ESTUARINE PROCESS GROUP

This process group includes ES1 (silt substrate), ES2 (narrow, sand substrate), ES3 (narrow, cobble substrate), ES4 (large estuary), and ES8 (glacial outwash) estuarine channel types. These are all intertidal streams and are directly influenced by tidal inundation. Stream stage fluctuations, channel morphology, sediment transport, and water chemistry are all characteristics that are influenced, to some degree, by saltwater inundation in these stream segments. Estuarine channels are associated with saltwater marshes, meadows, mudflats, and gravel deltas that are all predominantly depositional environments. The size of associated riparian areas encompasses the entire estuarine wetland system.

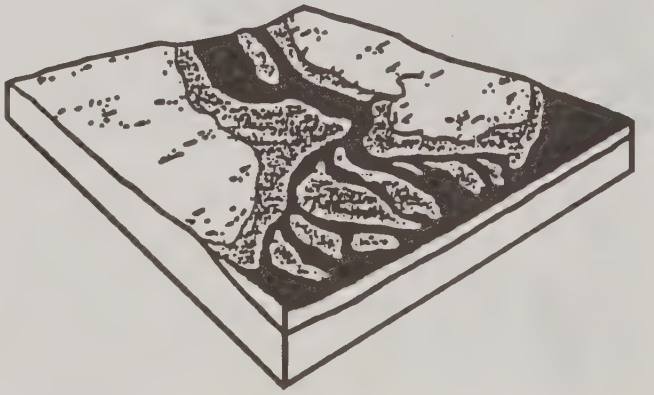


SILT SUBSTRATE ESTUARINE CHANNEL OR SLOUGH

Channel Mapping Symbol: ES1 (Formerly E4)

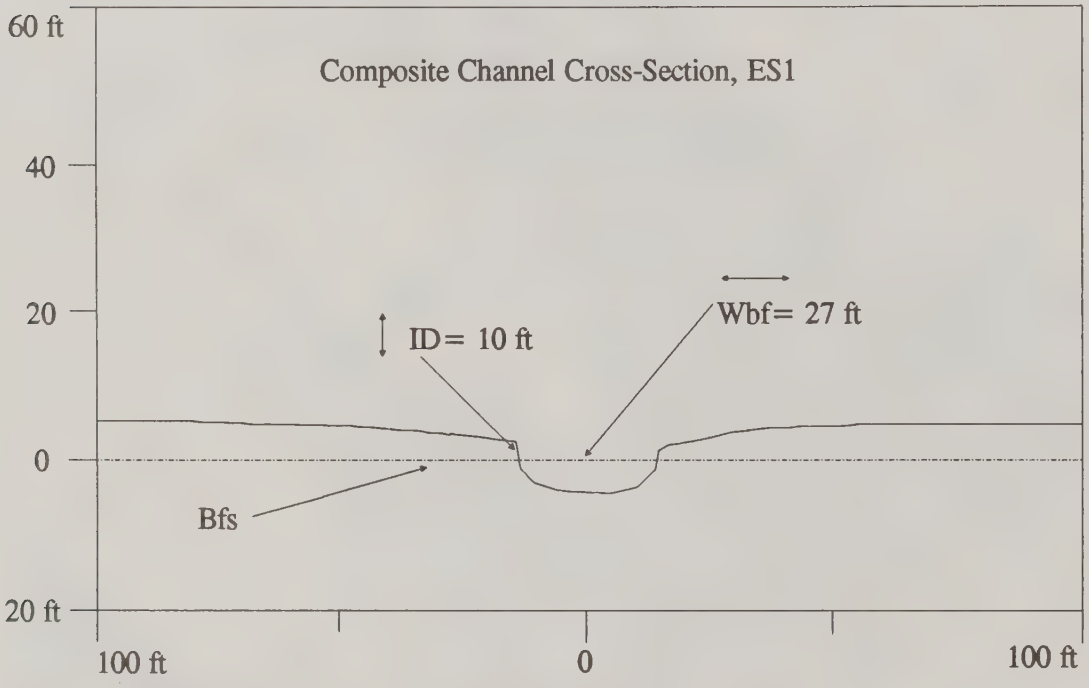
PHYSICAL CHARACTERISTICS

Geographic Setting: The ES1 is normally associated with salt chucks, shallow embayments along coastal forelands, and large glacial river deltas.



Similar Channel Types: ES2

Channel Structure



Stream Gradient: .....0-0.5%, mean = 0.5%
Incision Depth: .....0-4 m (13 ft), mean = 3 m (10 ft)
Bankfull Width:.....<20 m (66 ft), mean = 8 m (27 ft)
Dominant Substrate: .....Silt/clay to sand
Stream Bank Composition: .....Silt and sand
Sideslope Length: .....Not significant, flat landforms associated
Sideslope Angle: .....Not significant
Channel Pattern:.....Single, sinuous
Drainage Basin Area:.....Variable

INCHANNEL PHOTO: ES1

Riparian Vegetation: The riparian plant community is dominated by nonforested plant communities, and the Sitka spruce-cottonwood plant associations are of some significance. Nonforest vegetation consists of estuarine forbs and grasses.

Plant Association Series	% Cover
Nonforest	76%
Sitka Spruce-Cottonwood	13%
Sitka Spruce	11%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: ES1 streams are depositional channels. Stream energy is very low due to nearly flat gradients. Glide flow is the dominant velocity type. Water flow and depth is strongly influenced by the tidal stage. Substrate consists mainly of sand and silt. Suspended, glacial silt load is high in those channels associated with glacial outwash systems. Bank sloughing may be extensive along meander bends.

Aquatic Habitat Capability

Large Woody Debris .....N/A
Available Spawning Area (ASA).....N/A
Available Rearing Area (ARA).....Avg = 67% for 13 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	HIGH
Pink	NEG	NEG
Chum	NEG	LOW
Sockeye	NEG	LOW
Chinook	NEG	NEG
Dolly Varden	NEG	NEG
Steelhead	NEG	NEG

These channels are always accessible to anadromous species. Very little, if any, spawning occurs in these slough channels as 98% of the substrate is very fine gravel, sand, silt, clay, and muck. ARA is high, with 45% of the active water in pools having a mean depth of 0.52 meters (1.7 feet). Despite the high rearing potential, these channels are generally under-utilized. High densities of coho juveniles utilize rearing habitat during summer months. Sockeye salmon may use the slough (still water) for rearing where tidal influences are minimal. Chum salmon may temporarily remain here before migrating seaward.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	LOW
Sediment Retention	HIGH
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	N/A
Flood Plain Protection	LOW
Culvert Fish Passage	HIGH

ES1 channels are associated with extensive mudflat embayments and sediment retention is very high. Control of road drainage (BMP 14.9), erosion control, revegetation, and maintenance (BMPs 13.11-13.13) should be emphasized.

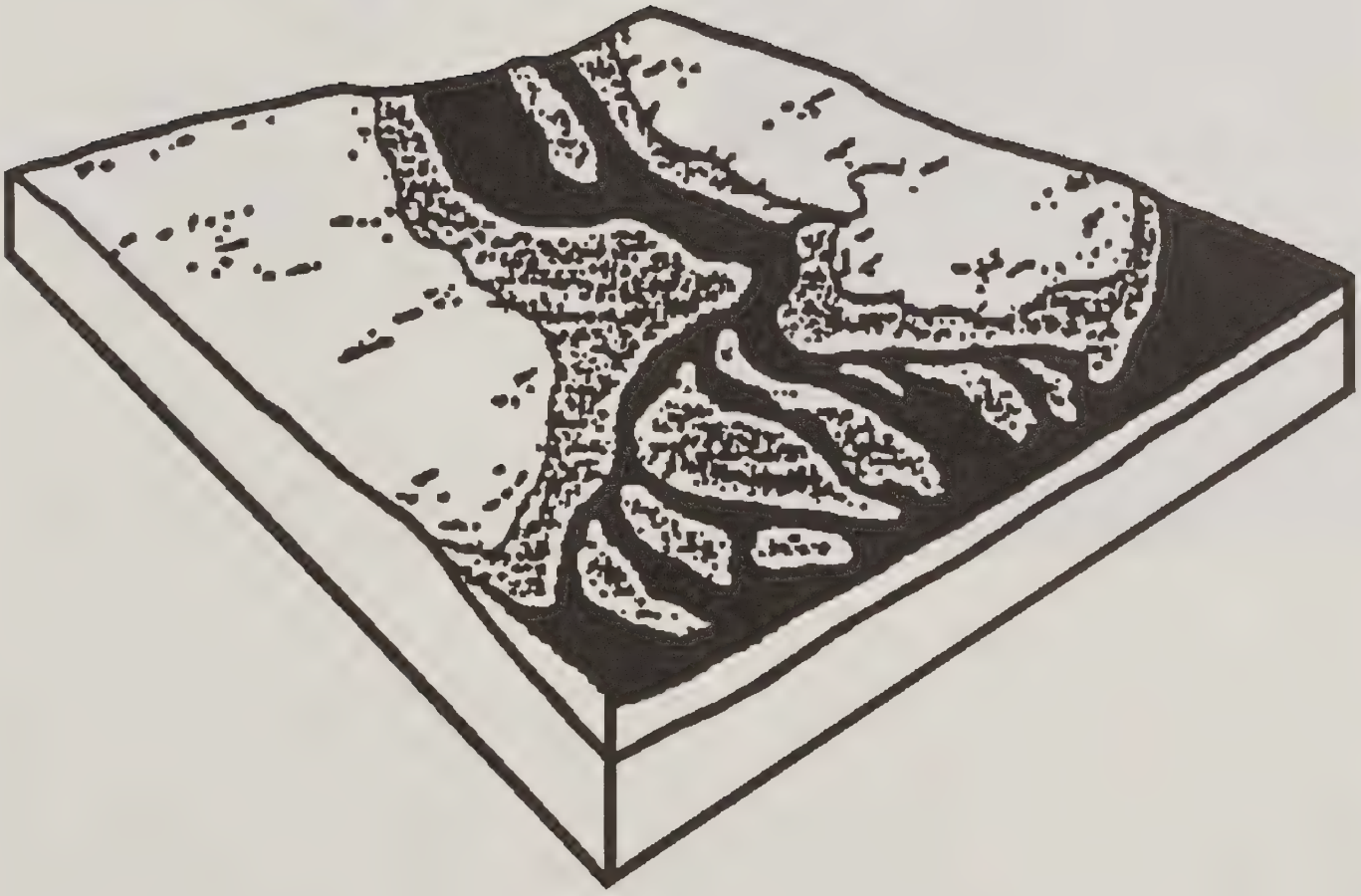
Stream bank erosion risk is moderate. Although stream banks are composed of relatively cohesive silt and clay size sediments, they are subject to undermining by strong tidal ebb and flood currents. Channel protection (BMP 13.16) and bridge and culvert design (BMP 14.17) are important measures to consider to reduce stream bank erosion. Culvert installations on upland segments of ES1 channels should be designed to provide unrestricted upstream migration for juvenile salmonids (BMPs 14.14, 14.17).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern (BMP 14.14).

Riparian Management Opportunities:

Sport Fish Potential	LOW
Enhancement Opportunities	N/A

Estuarine Process Group



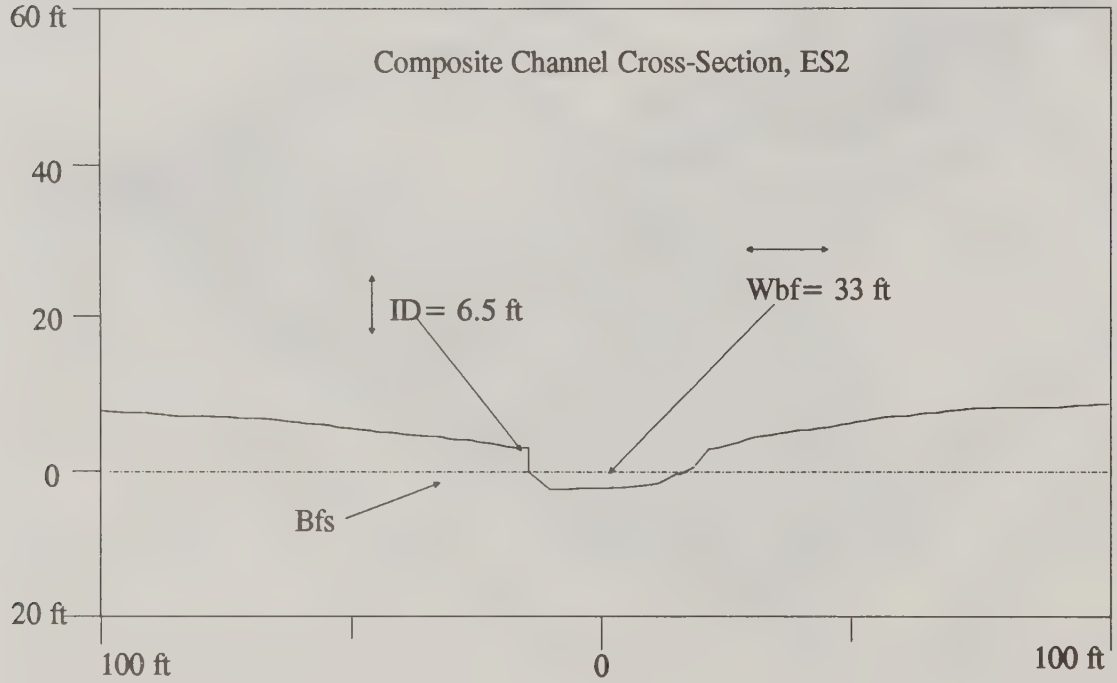
NARROW SMALL SUBSTRATE ESTUARINE CHANNEL
Channel Mapping Symbol: ES2 (Formerly E3)

PHYSICAL CHARACTERISTICS

Geographic Setting: ES2 streams occur exclusively within estuary landforms, usually draining a small to moderate size watershed. These channels are most commonly found in drainages along outer coastal beaches.

Similar Channel Types: ES3

Channel Structure



Stream Gradient: .....< or = 1%, mean = 1%
Incision Depth: .....< 3 m, mean = 2 m (6.5 ft)
Bankfull Width:.....< 10 m (33 ft)
Dominant Substrate: .....Sand to gravel
Stream Bank Composition: .....Alluvium (sand)
Sideslope Length: .....Not significant, flat landform associated
Sideslope Angle: .....Not significant
Channel Pattern:.....Single, sinuous
Drainage Basin Area:.....< 25.9 km^2 (< 10 mi^2)

Riparian Vegetation: The riparian plant community is dominated by nonforested plant communities. The western hemlock/blueberry plant associations are also significant. Nonforested plant communities consist of estuarine forbs and grasses.

Plant Association Series	% Cover
Nonforest	48%
Western Hemlock	15%
Western Hemlock-Red Cedar	13%
Sitka Spruce	12%

Channel Type Phases: N/A

INCHANNEL PHOTO: ES2

MANAGEMENT CONSIDERATIONS

Hydrologic Function: ES2 streams are predominantly depositional channels. Stream energy is very low for these channels. Substrate material consists mainly of gravels and sand. Bank erosion is influenced more by ocean erosion processes than by stream discharge events.

Aquatic Habitat Capability

Large Woody Debris ..... < 500 ft^3/1000 linear ft
Available Spawning Area (ASA).. Insufficient data
Available Rearing Area (ARA).... Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	HIGH	HIGH
Pink	HIGH	HIGH
Chum	HIGH	LOW
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	MOD	MOD
Steelhead	NEG	NEG

These channels are always accessible to anadromous species. ASA is high and seems to be limited primarily by fine sediment content. Pink and chum salmon frequently, and Dolly Varden char occasionally, spawn in ES2 channels. Coho salmon and Dolly Varden char will move into ES2 channels from upstream areas during summer and will rear until fall. Pink and chum salmon fry may also temporarily inhabit the ES2 channel before migrating seaward. Overwintering habitat is minimal (mean pool depth of 0.02 meters [0.6 feet]).

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....LOW
Sediment Retention .....HIGH
Stream Bank Sensitivity .....HIGH
Sideslope Sensitivity .....N/A
Flood Plain Protection Need .....MOD
Culvert Fish Passage.....MOD

The ES2 channel type is associated with low relief coastal landforms, therefore, sediment retention is rated high.

Stream banks are composed of sand and fine gravel, and are, therefore, highly sensitive to erosion. Beach erosion processes often have a dominant influence on these outer coastal estuarine streams. Stream channel protection (BMP 13.16), construction in riparian areas (BMP 14.13), and bridge/culvert design (BMP 14.17) should be emphasized.

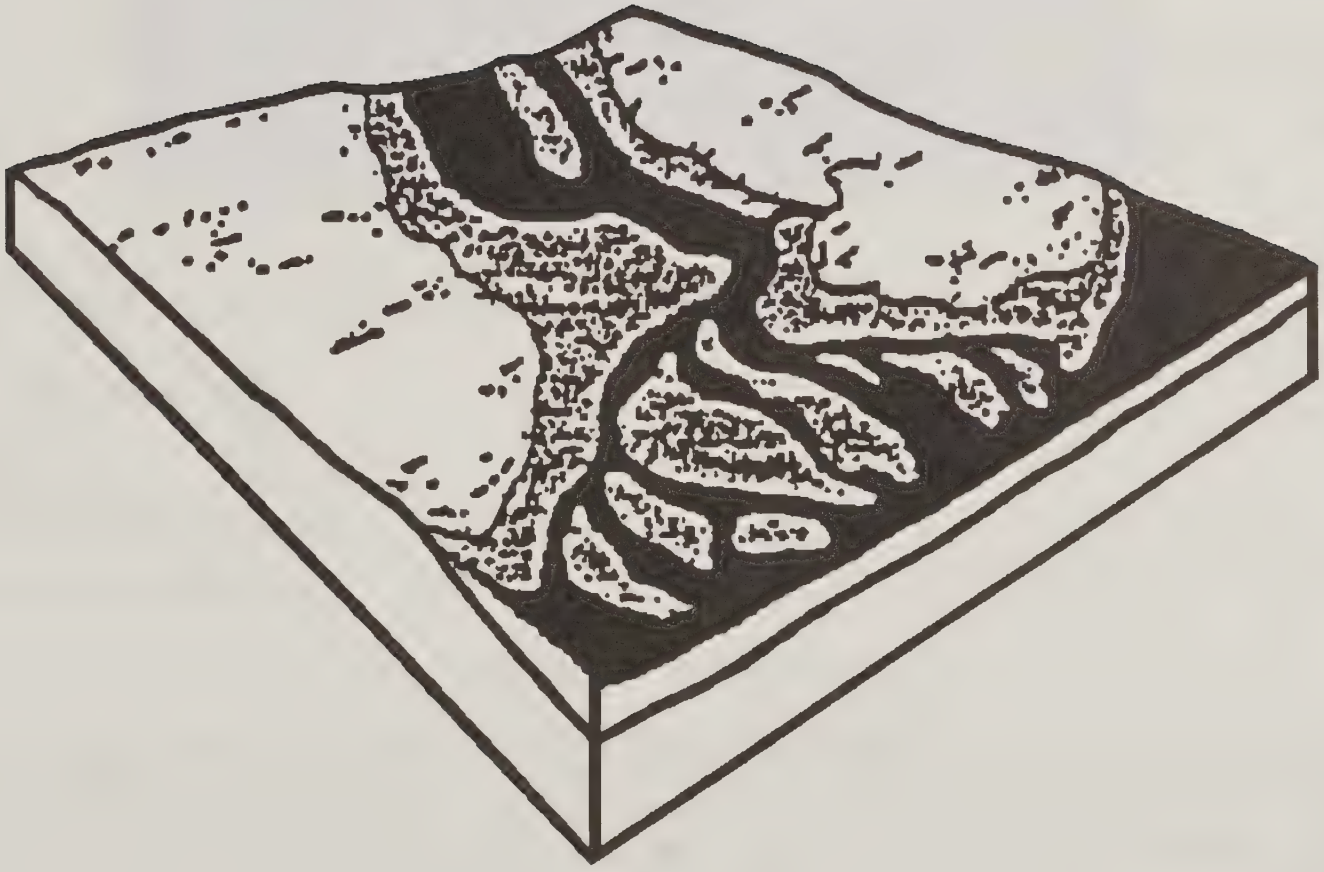
Culvert installations in the upland segments of ES2 channels should be designed to provide unrestricted passage for juvenile salmonids (BMP 14.17).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

Riparian Management Opportunities:

Sport Fish Potential..... LOW
Enhancement Opportunities ..... N/A

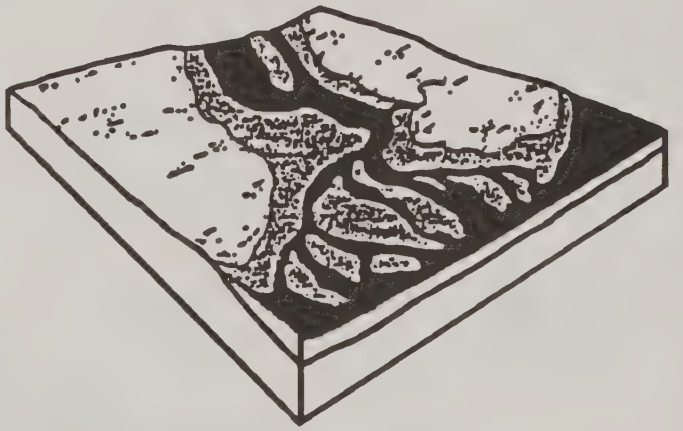
Estuarine Process Group



NARROW LARGE SUBSTRATE ESTUARINE CHANNEL
Channel Mapping Symbol: ES3 (Formerly E2)

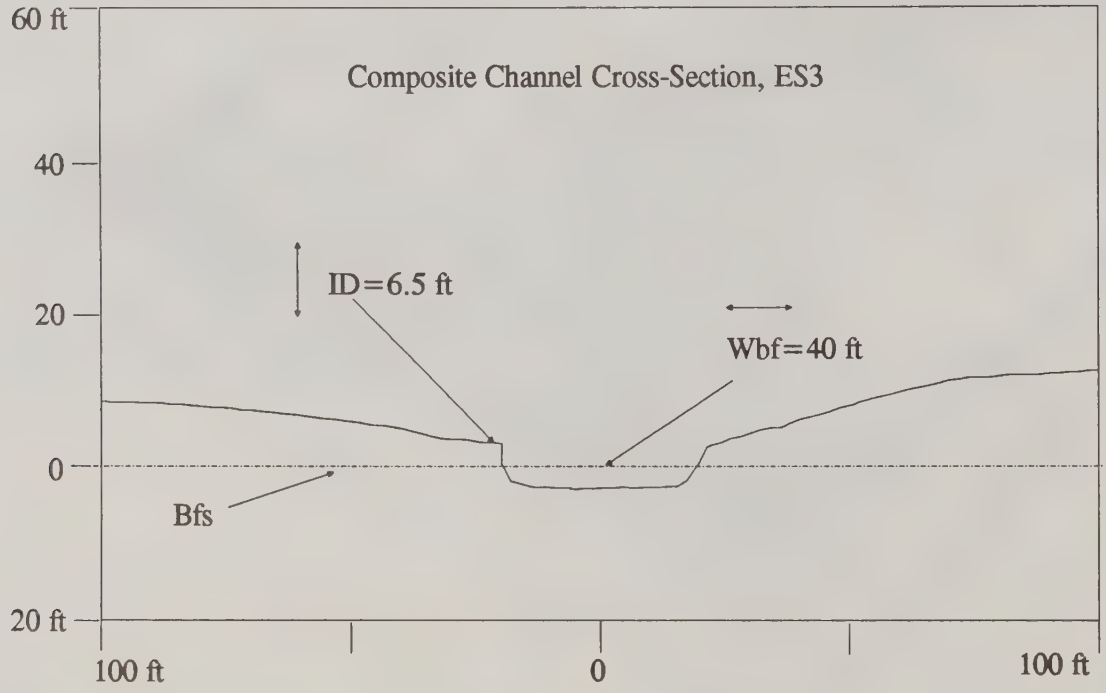
PHYSICAL CHARACTERISTICS

Geographic Setting: ES3 streams occur in small estuaries, usually less than 100 acres in size. These streams are most commonly associated with small, high relief drainage basins that empty into inland straits and inlets.



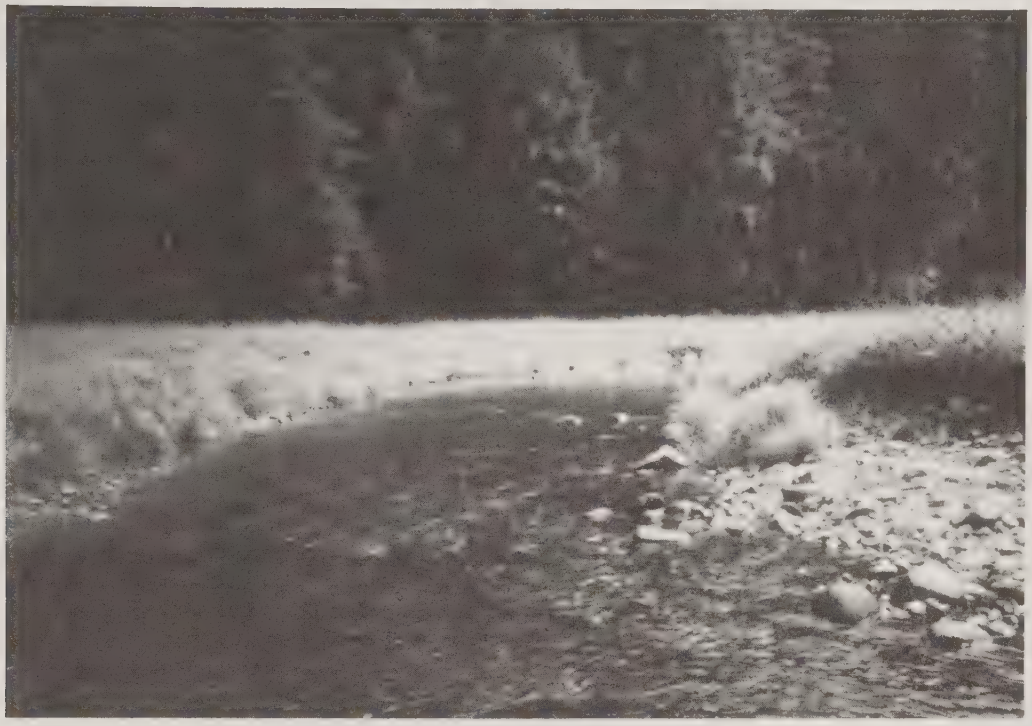
Similar Channel Types: ES2

Channel Structure



Stream Gradient: .....0-3%, mean = 1%
Incision Depth: .....< 3 m (10 ft), mean = 2 m (6.5 ft)
Bankfull Width:.....< 10 m (33 ft) at upstream end
Dominant Substrate: .....Fine gravel to small boulder
Stream Bank Composition: .....Alluvium (occasional bedrock outcrops)
Sideslope Length: .....Not significant, flat landform associated
Sideslope Angle: .....Not significant
Channel Pattern:.....Single, linear
Drainage Basin Area:.....< 25.9 km^2 (< 10 mi^2)

INCHANNEL PHOTO: ES3



Riparian Vegetation: The riparian plant community is dominated by nonforested plant communities, which consist of estuarine forbs and grasses.

Plant Association Series	% Cover
Nonforest	75%
Sitka Spruce	13%
W.Hemlock-Alaska Cedar	8%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: ES3 streams are predominantly depositional channels. Stream energy is low, although relatively, it is the highest of the estuarine process group. Moderate gradient contained channels often directly precede the ES3 in the watershed network. Moderate loads of coarse and fine gravel may be delivered to the ES3 during large flow events. Channel banks are relatively stable and produce only minor inputs of sediment from erosion processes (bank undercutting and sloughing). Tidal processes also affect deposition and erosion in these channels.

Aquatic Habitat Capability

Large Woody Debris ..... < 500 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	MOD	LOW
Pink	LOW	LOW
Chum	LOW	LOW
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	MOD	MOD
Steelhead	NEG	NEG

These channels are frequently accessible to anadromous species. Pink and chum salmon generally spawn in other channel types and occasionally use ES3 segments. Use is increased where larger patches of gravel accumulate near small boulders and bedrock outcrops. Coho may migrate downstream to rear in pools (12% of active water), and pink and chum may temporarily stay in these channels during their seaward migration. Dolly Varden char may spawn and rear in ES3 channels in moderate densities.

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	LOW
Sediment Retention	MOD
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	N/A
Flood Plain Protection Need	MOD
Culvert Fish Passage	HIGH

Sediment retention is rated moderate for ES3 channels. These channels are found on high energy beaches often in association with streams making a rapid transition from high energy mountainslope channel types. Fine sediments are readily flushed from the ES3 channel during flood or storm events.

Stream banks are composed of coarse gravel or cobble size alluvium. Therefore ES3 channels are only moderately susceptible to stream bank erosion.

Flood plain protection need is moderate. Estuarine habitat capability is limited in the ES3 riparian area due to higher energy streamflows and higher beach erosion rates.

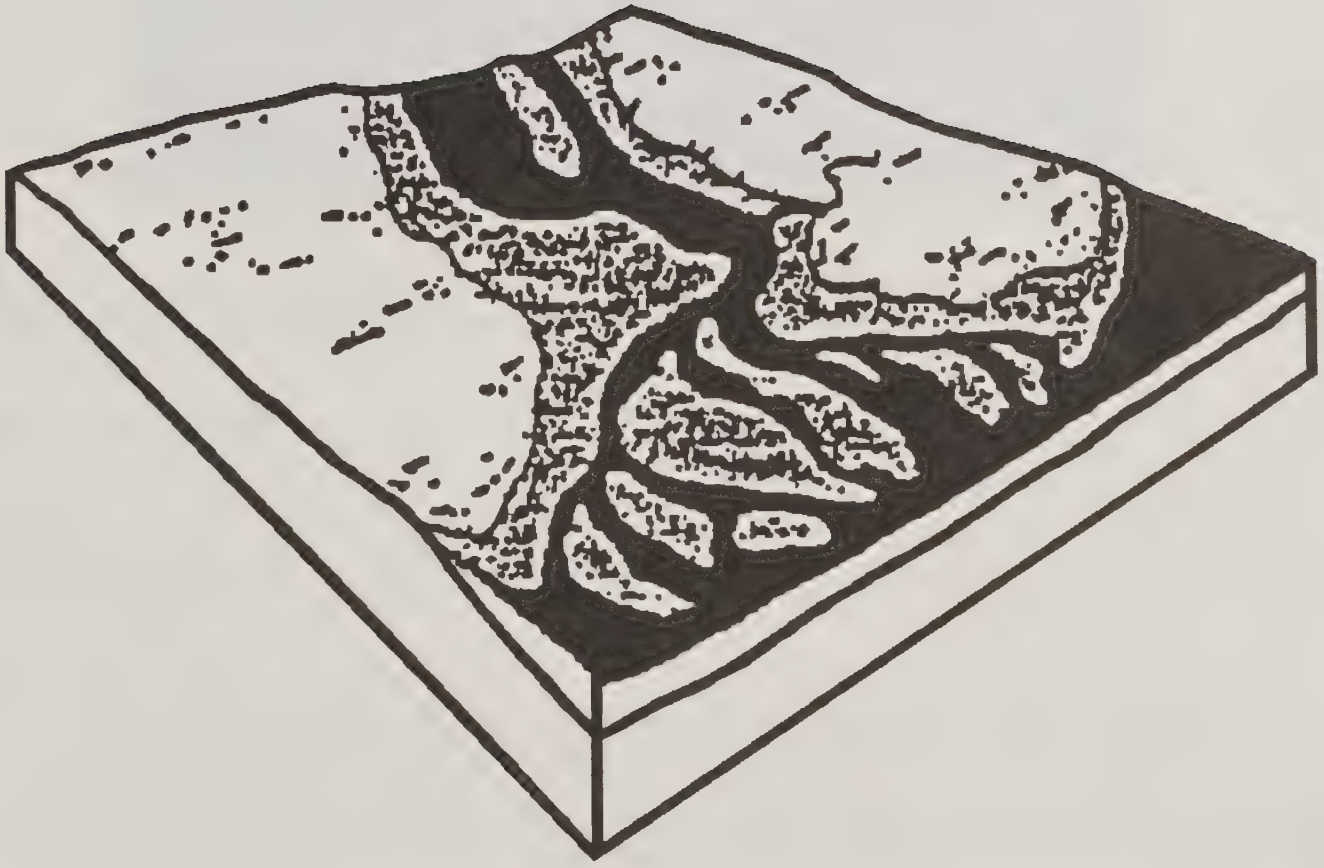
It is important to consider upstream anadromous fish migration in these streams (BMPs 14.4, 14.17).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern (BMP 14.14).

Riparian Management Opportunities:

Sport Fish Potential	LOW
Enhancement Opportunities	N/A

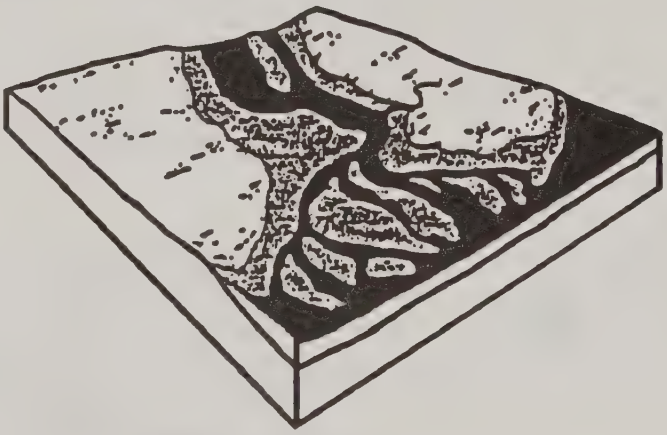
Estuarine Process Group



LARGE ESTUARINE CHANNEL
Channel Mapping Symbol: ES4 (Formerly E1)

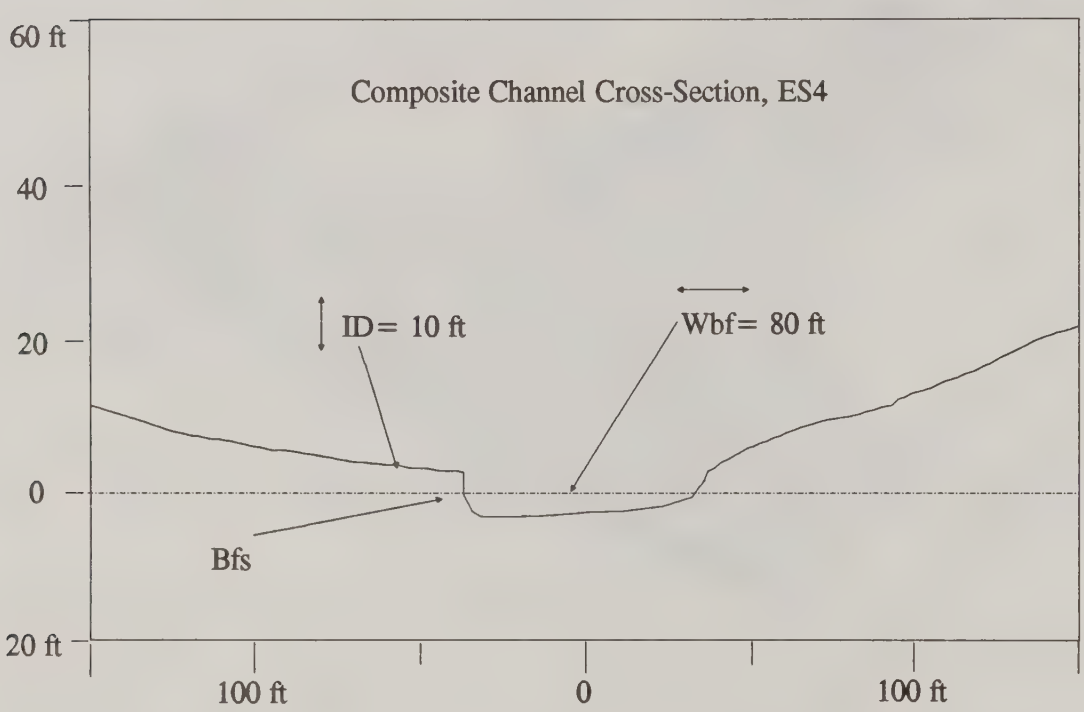
PHYSICAL CHARACTERISTICS

Geographic Setting: The ES4 channels are associated with estuarine deltas of moderate to large drainage basins of inland bays and inlets.



Similar Channel Types: ES3, FP4

Channel Structure



Stream Gradient: .....< or = 2%, mean = 1%
Incision Depth: .....<5 m (16.5 ft)
Bankfull Width:.....>10 m (33 ft), mean at upstream end = 23 m (75.9 ft)
Dominant Substrate: .....Gravel to cobble
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant, flat estuarine landform associated
Sideslope Angle: .....Not significant
Channel Pattern:.....Single to multiple channel, normally single at the apex of the fan with channel branching at the terminus.
Drainage Basin Area:.....25.9-78 km^2 (10-30 mi^2)

INCHANNEL PHOTO: ES4

Riparian Vegetation: The ES4 nonforest riparian plant communities are dominated by grass and sedge communities. The Sitka spruce series and the western hemlock series are also significant beach fringe communities.

Plant Association Series	% Cover		
	ES4	ES4l	ES4d
Nonforest	59%	---	---
Sitka Spruce	23%	---	---
Western Hemlock	14%	---	---

Channel Type Phases:

- ☐ ES4l - LARGE SUBSTRATE PHASE have larger material, cobble/small boulder size range. Available spawning habitat is somewhat less than is typical for this channel type.
- ☐ ES4d - SAND DUNE PHASE are incised beach or sand dune channels found in coastal foreland areas. They are differentiated by the amount of glacial influence.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: The ES4 streams are depositional channels subject to tidal influences. Stream energy is low due to wide, low gradient channels. Gravel and sand bars tend to be stable bed features, except during extreme flow events. Large woody debris can significantly influence channel structure. Debris accumulations are important in forming pool habitat in ES4 channels.

Aquatic Habitat Capability

Large Woody Debris .....1200 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 22% for 11 sites
Available Rearing Area (ARA).....Avg = 7% for 10 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	HIGH	LOW
Pink	HIGH	HIGH
Chum	HIGH	HIGH
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	MOD	MOD
Steelhead	NEG	NEG

These channels are always accessible to anadromous species. Generally, high quality substrate provides high available spawning area (ASA 22%). Spawning pink and chum salmon will frequent ES4 channels in high densities. Although pool development is minimal (3% of water surface area), rearing coho salmon will move downstream from the mainstem in the summer to rear here (ARA 7%). Pink and chum salmon fry may temporarily remain in the ES4 system prior to moving seaward.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	MOD
Sediment Retention	HIGH
Stream Bank Sensitivity	HIGH
Sideslope Sensitivity	N/A
Flood Plain Protection Need	HIGH
Culvert Fish Passage	N/A

Sediment deposition is a dominant process in estuarine deltas, therefore, sediment retention in ES4 channels is high. These channels are very sensitive to intrusion of fine sediments into spawning beds. The effect of cumulative sediment impacts from upstream watershed disturbance is a major management concern. Erosion control (BMPs 13.11-13.13), control of road drainage (BMP 14.9), and road maintenance (BMPs 14.20, 14.21) are mitigation measures that should be emphasized in areas near these streams.

Stream bank sensitivity is high due to high amounts of fine unconsolidated alluvium in ES4 stream banks. Bank erosion can be a significant source of fine sediment in these channels. Channel protection (BMP 13.16) and bridge design and implementation (BMP 14.17) should be emphasized.

Protection of estuarine wetland and flood plain habitat (BMPs 12.6, 13.15, 14.13) is an important management consideration for ES4 channels and associated riparian areas. These intertidal wetlands provide extremely important habitat for waterfowl, furbearers, and a wide variety of aquatic species.

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

LANDSCAPE PHOTO: ES4

Riparian Management Opportunities:

Sport Fish Potential..... HIGH
Enhancement Opportunities ..... Large Wood Placement

ES4 channel segments have excellent sport fishing opportunities. Foot access is good from the beach and also from small boats at high tide. Primary species of interest are Dolly Varden char, coho, and pink salmon.

Large woody debris fish enhancement projects may be options in ES4 channels. These structures can be used to improve cover and available pool habitat for adult spawners and rearing juvenile fish. Structures must be designed and anchored to withstand extreme tides.

BROAD BRAIDED GLACIAL OUTWASH ESTUARINE CHANNEL
Channel Mapping Symbol: ES8 (Formerly E5)

PHYSICAL CHARACTERISTICS

Geographic Setting: ES8 streams are associated with large glacial river deltas. These watersheds typically have greater than 15 percent of their drainage area covered by active glaciers and snowfields.

Similar Channel Types: GO3

Channel Structure
Stream Gradient: 0.5-1.5%
Incision Depth: .....< 2 m (6.5 ft)
Bankfull Width:.....Variable, normally very wide, braided delta
Dominant Substrate: .....Sand to coarse gravel
Stream Bank Composition: .....Glacial alluvium
Sideslope Length: .....Not significant, broad flat landform
Sideslope Angle: .....Not significant
Channel Pattern:.....Highly braided
Drainage Basin Area:.....> 51.8 km^2 (20 mi^2)

Riparian Vegetation: The riparian areas immediately adjacent to these channels generally are unvegetated sand and gravel outwash and extensive tidal mudflats. Salt tolerant grasses and sedges dominate the more stable terraces away from the active deposition zone.

Channel Type Phases: N/A

LANDSCAPE PHOTO: ES8

MANAGEMENT CONSIDERATIONS

Hydrologic Function: ES8 channels are depositional streams. GO3 channels immediately precede the ES8, and, consequently, characteristics such as braided channels and excessive sediment loads are very similar. ES8 substrate material ranges from small cobble to glacial silt, and suspended silt loads are high. Tidal influences may affect stream flow and river stage a great distance upstream from saltwater.

Aquatic Habitat Capability

Large Woody Debris .....N/A
Available Spawning Area (ASA).....N/A
Available Rearing Area (ARA).....N/A

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	MOD
Chinook	NEG	NEG
Dolly Varden	NEG	NEG
Steelhead	NEG	NEG

ES8 channels are always accessible to anadromous species. Out migrants and returning adults of all anadromous species may make frequent use of these channels for staging prior to in or out migration. Sockeye use channel margins and slough habitat for summer rearing.

Spawning habitat is negligible.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris ..... LOW
Sediment Retention ..... HIGH
Stream Bank Sensitivity..... HIGH
Sideslope Sensitivity..... N/A
Flood Plain Protection..... HIGH
Culvert Fish Passage ..... HIGH

These channels are located at the terminus of large glacial rivers, therefore, sediment deposition is extremely high.

Stream bank sensitivity is rated high due to fine textured bank materials and highly variable flood flows. Channel protection (BMP 13.16) and bridge/culvert design (BMP 14.17) are important considerations. Lateral channel migration is extremely active in most ES8 channel types.

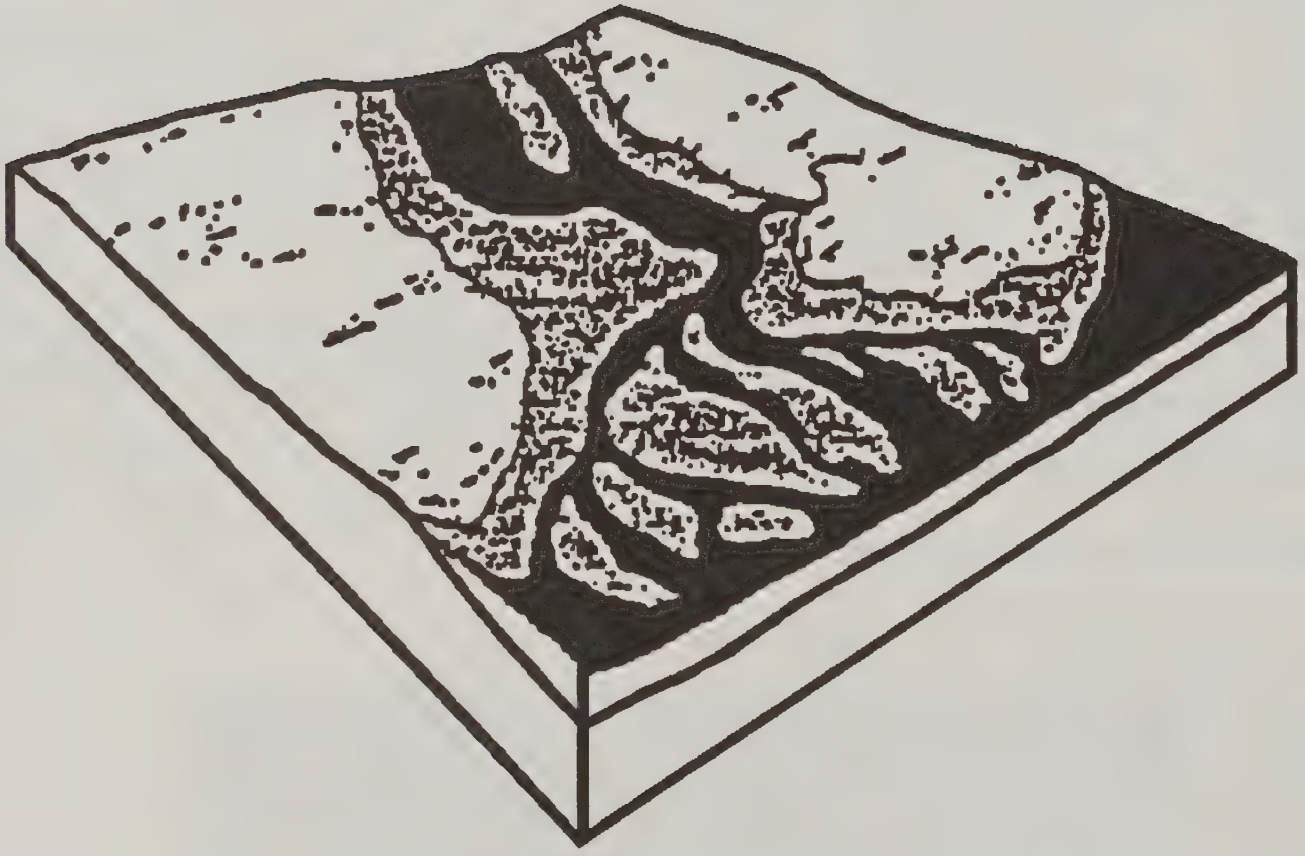
Riparian areas adjacent to ES8 segments often have extensive tidal marshes. Protection of these wetland values is an important management concern.

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

Riparian Management Opportunities:

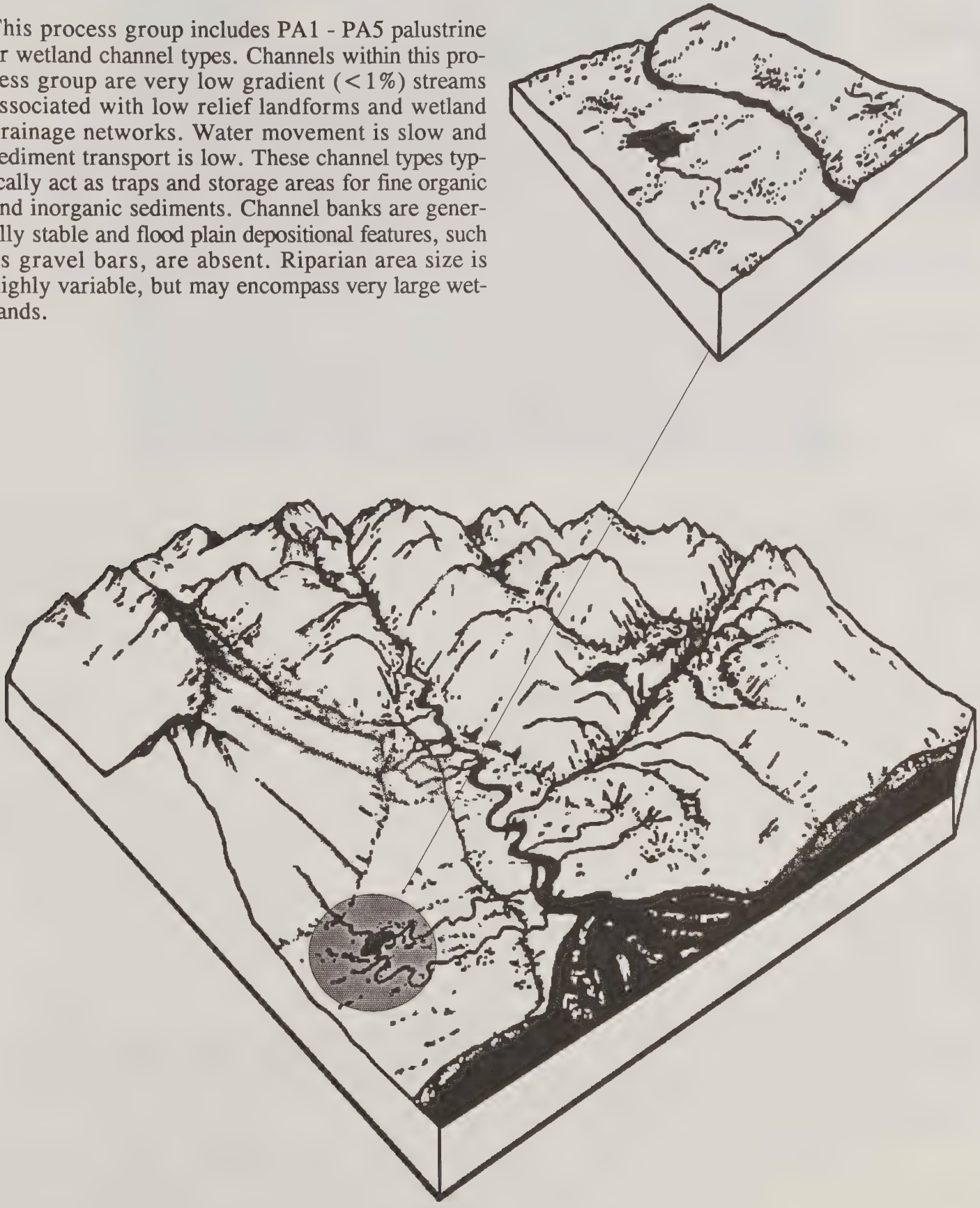
Sport Fish Potential ..... LOW
Enhancement Opportunities ..... N/A

Estuarine Process Group



PALUSTRINE PROCESS GROUP

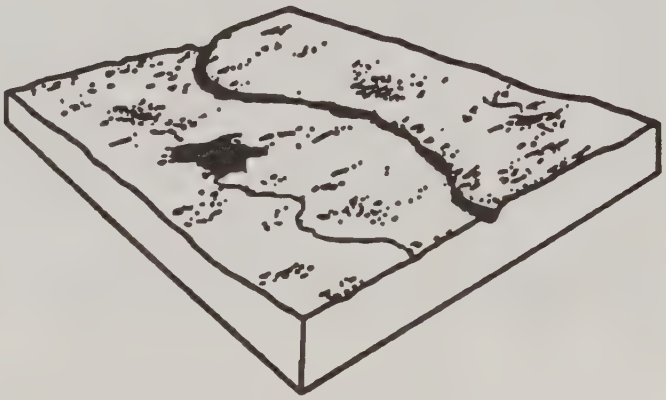
This process group includes PA1 - PA5 palustrine or wetland channel types. Channels within this process group are very low gradient (< 1%) streams associated with low relief landforms and wetland drainage networks. Water movement is slow and sediment transport is low. These channel types typically act as traps and storage areas for fine organic and inorganic sediments. Channel banks are generally stable and flood plain depositional features, such as gravel bars, are absent. Riparian area size is highly variable, but may encompass very large wetlands.



NARROW PLACID FLOW CHANNEL
Channel Mapping Symbol: PA1 (Formerly L1)

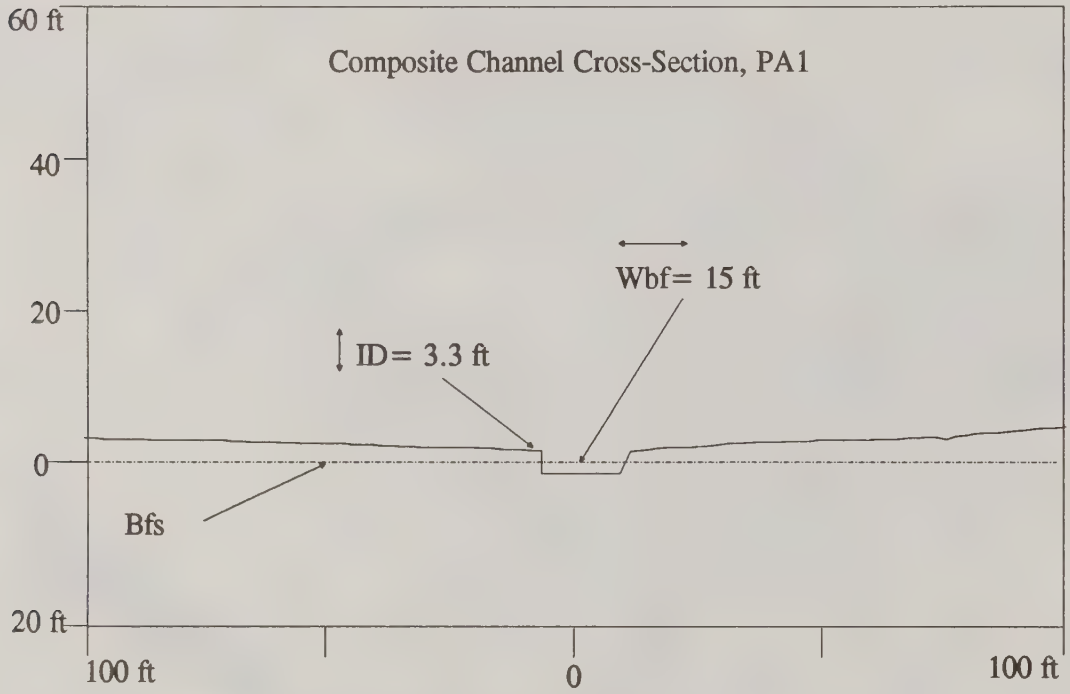
PHYSICAL CHARACTERISTICS

Geographic Setting: PA1 streams often occur in association with muskeg bogs on low relief landforms. Channel pattern may be highly sinuous. These streams are commonly associated with ponds and small lakes.



Similar Channel Types: PA3, MC1.4

Channel Structure



Stream Gradient: .....<2%, mean = 1.0%
Incision Depth: .....< or = 2 m (6.5 ft), mean = 1 m (3.3 ft)
Bankfull Width:.....< 10 m (33 ft), mean = 4.6 m (15 ft)
Dominant Substrate: .....Organic silt to very fine gravel
Stream Bank Composition: .....Alluvium and/or organic mat
Sideslope Length: .....Not significant, palustrine area associated with this channel
Sideslope Angle: .....Not significant, very flat landforms associated
Channel Pattern:.....Single, sinuous
Drainage Area: .....< 5.2 km^2 (<2 mi^2)

INCHANNEL PHOTO: PA1

Riparian Vegetation: The riparian plant communities in the PA1 channel type are dominated by nonforested sedge, sphagnum, and sweet gale bog plant communities. The western hemlock series, mountain hemlock/blueberry series, and shore pine series share dominance in the PA1v phase, with nonforested plant communities being of some significance.

Plant Association Series	% Cover	
	PA1	**PA1v**
Nonforest	72%	16%
Shore Pine	9%	24%
Western Hemlock	7%	22%
Sitka Spruce	6%	12%
M.Hemlock/Blueberry	---	23%

Channel Type Phases:

☐ PA1v - SCRUB FOREST PHASE: Riparian vegetation interspersed with patches of muskeg or shrub (Sitka alder and shore pine) plant communities.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: PA1 channels are sediment storage channels. Stream energy is low, therefore, organic silt, sand, and very fine gravel size sediments are retained in PA1 reaches. Streamflow in these channels is somewhat influenced by runoff from extensive muskeg bogs.

Aquatic Habitat Capability

Large Wood Debris..... < 500 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	HIGH
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	LOW	MOD
Chinook	NEG	NEG
Dolly Varden	LOW	HIGH
Steelhead	NEG	NEG

These channels are moderately accessible to anadromous fish. ASA is low because of the extremely fine substrate (7% fine gravel, 24% sand, and 69% silt and organic muck). Coho salmon and Dolly Varden char will spawn in patches of gravel and sand. Sockeye salmon will spawn in sand and muck where upwelling groundwater provides adequate an supply of dissolved oxygen to the redds. Coho salmon and Dolly Varden char frequently, and sockeye occasionally, rear in these channels. Large amounts of deep (mean depth = 0.7 meters [2.3 feet]), pooled water (51% of active water), in conjunction with cover from overhanging stream bank vegetation, provide high ARA. These channels probably provide little overwintering habitat unless flowing from a lake source or a spring fed tributary.

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	LOW
Sediment Retention	HIGH
Stream Bank Sensitivity	LOW
Sideslope Sensitivity	N/A
Flood Plain Protection Need	MOD
Culvert Fish Passage	MOD

Sediment retention is very high in these palustrine channels. However, lack of spawning habitat generally makes these channels less sensitive to sedimentation impacts than flood plain channels.

Stream banks are composed of dense organic root mats that are resistant to erosion. However, bank degradation can occur from heavy foot traffic (BMP 16.7).

Fish access is often a concern in PA1 channel segments. Culverts laid at stream grade should not be barriers to juvenile fish passage (BMP 14.17).

Management prescriptions should emphasize wetland protection and control of potential erosion sources (BMPs 13.15, 13.11-13.13).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

INCHANNEL PHOTO: PA2

LANDSCAPE PHOTO: PA2

Riparian Vegetation: The riparian plant communities are dominated by nonforested sedge and sphagnum bog communities and the shore pine/crowberry plant association.

Plant Association Series	% Cover
Nonforest	40%
Shore Pine	24%
Sitka Spruce	20%
Western Hemlock-Red Cedar	13%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: PA2 channels are sediment storage sinks consisting of glide flow extensions from valley bottom lakes, or wide, low velocity glides associated with wetlands. Palustrine areas are normally associated with PA2 channels, therefore, the substrate contains a large percentage of organic silt. Due to flat gradients, stream energy is very low. Little stream bank erosion occurs during high flow events due to the flow attenuation capacity of the associated lakes or wetlands.

Aquatic Habitat Capability

Large Woody Debris .....2700 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho Salmon	LOW	HIGH
Pink Salmon	NEG	NEG
Chum Salmon	NEG	NEG
Sockeye Salmon	MOD	MOD
Chinook Salmon	NEG	NEG
Dolly Varden Char	LOW	HIGH
Steelhead	NEG	NEG

These channels are frequently accessible to anadromous species. Available spawning area (ASA) is low due to placid water flow and predominantly gravel, sand, and silt/muck substrate. Coho and Dolly Varden will spawn in scattered pockets of gravel and sand. In addition, sockeye will spawn on a sand and muck bottom, however, most spawning takes place in areas of upwelling groundwater, which tends to offset the substrate deficiencies. Much of the PA2 channel consists of deep pools (mean pool depth = 0.9 meters [3.0 feet]). The addition of large woody debris cover yields a system that is virtually all rearing area. Coho, sockeye, and Dolly Varden frequently take advantage of this prime habitat. These channels provide extensive overwintering habitat due to temperature moderation from lake water sources and shallow groundwater aquifers.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....MOD
Sediment Retention .....HIGH
Stream Bank Sensitivity.....LOW
Sideslope Sensitivity.....N/A
Flood Plain Protection Need .....MOD
Culvert/Fish Passage .....LOW

Large woody debris sources are highly variable in PA2 channels. Most large woody debris recruitment occurs from beaver activity or large wood that floats in from upstream reaches or lake shores. Retention time of large woody debris in these channels is high. Accumulations of large woody debris provide added cover and protection for rearing fish.

Sediment retention is very high in these channels. Due to naturally high concentrations of fines in PA2 channels, it is difficult to assess cumulative effects of sediment from upstream activities.

Stream banks are composed of organic soils held together by dense root mats that are resistant to erosion by the low velocity stream flows. Disturbances to stream bank vegetation (heavy foot traffic) may break down channel banks making them susceptible to sloughing (BMP 16.7).

These channels are associated with important wetland/flood plain complexes that function to moderate runoff, store sediment, and bank nutrients. Protection of wetland functions and values is an important management consideration for these streams (BMPs 12.4-12.6, 13.15).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

Riparian Management Opportunities:

Sport Fish Potential..... MODERATE
Enhancement Opportunities ..... Beaver Introduction, Fry Stocking, Large Wood Placement

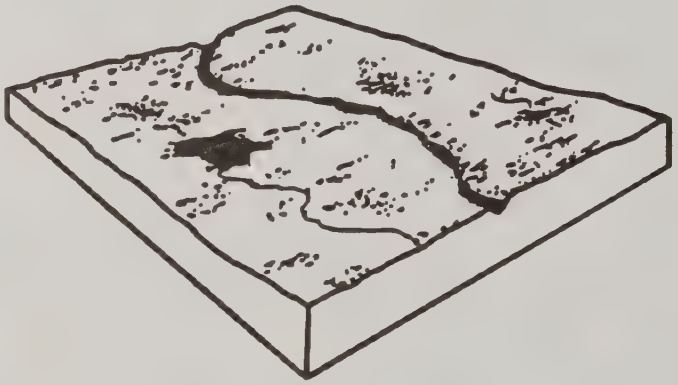
Sport fishing opportunities are often good in PA2 channels, with the best fishing generally being associated with lake inlets and outlets. Species of primary interest are Dolly Varden, cutthroat, and sockeye. Small boat access, particularly from lakes, is usually good.

Encouragement of beaver colonization or the addition of large woody debris can significantly enhance rearing habitat associated with PA2 channels.

SHALLOW GROUNDWATER FED SLOUGH
Channel Mapping Symbol: PA3 (Formerly L4)

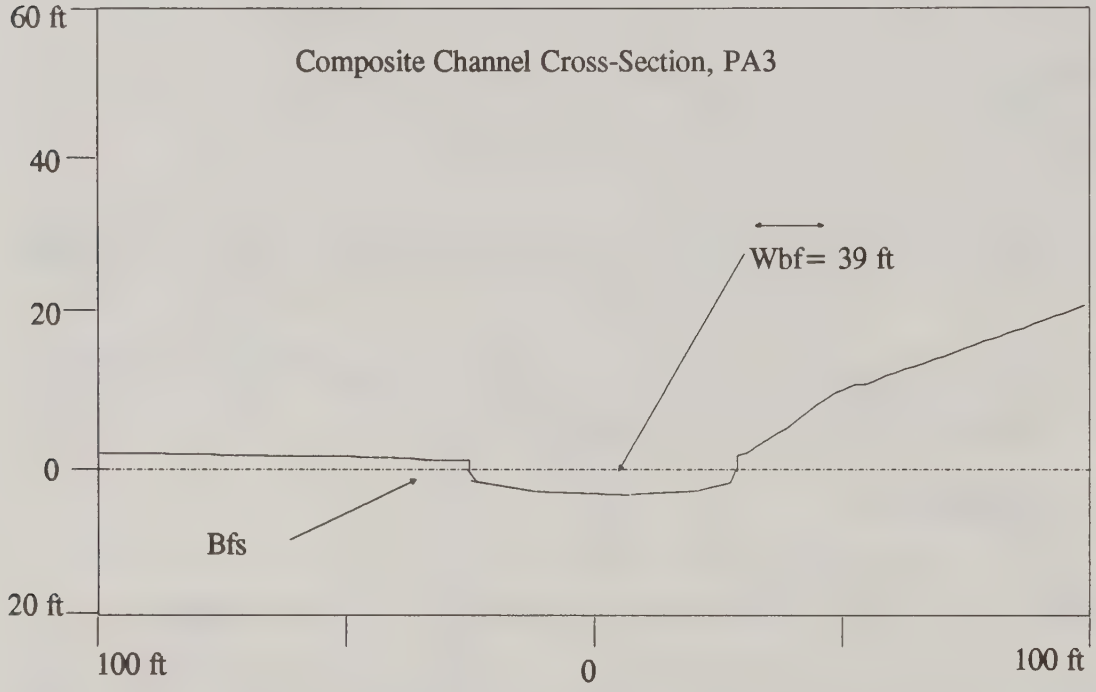
PHYSICAL CHARACTERISTICS

Geographic Setting: PA3 streams are located on low relief glacial outwash flood plains. These channels typically occupy relic glacial braided channels and are recharged by clear groundwater flow.



Similar Channel Types: PA1, PA4

Channel Structure



Stream Gradient: .....0.0-1%, mean = 1%
Incision Depth: .....< or = 4 m (13 ft), mean = 2.5 m (8 ft)
Bankfull Width:.....Variable, mean = 12 m (39 ft)
Dominant Substrate: .....Silt to fine gravel
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant
Sideslope Angle: .....Not significant*
Channel Pattern:.....Single to braided
Drainage Area: .....Variable

*In glacial outwash areas the PA3 may be proximal to moraine deposits. In these cases a mean sideslope length equals 46 m (150 ft) and mean sideslope angle equals 27 degrees.

INCHANNEL PHOTO: PA3

Riparian Vegetation: The riparian plant communities are dominated by the Sitka spruce series, and the western hemlock series. Nonforested plant communities, which are predominantly willow or bog communities, commonly occur as a fringe along stream banks.

Plant Association Series	% Cover
Sitka Spruce	46%
Nonforest	44%
Western Hemlock	10%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: PA3 streams tend to store fine sediment due to low stream energy and, normally, low peak flows. During high flow periods the PA3 may be inundated by water heavily laden with silt from adjacent glacial outwash channels. Base stream flow in these channels is maintained by groundwater recharge.

Aquatic Habitat Capability

Large Woody Debris ..... < 500 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	HIGH
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	MOD	HIGH
Chinook	LOW	MOD
Dolly Varden	LOW	MOD
Steelhead	NEG	NEG

PA3 channels are only moderately accessible to anadromous species because of seasonally low flows and possible physical isolation. Substrate consists of 20% gravel and 75% fine gravel, sand, and silt/muck. ASA is generally low, but what is available may be used by coho salmon, chinook salmon, and Dolly Varden char. Sockeye salmon will spawn in these channels more frequently, especially where there is active upwelling of groundwater. All of the above species, especially coho and sockeye salmon, find PA3s favorable for rearing.

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	LOW
Sediment Retention	HIGH
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	N/A
Flood Plain Protection	HIGH
Culvert Fish Passage	N/A

PA3 stream segments are found on flood plains or glacial outwash plains and thus have relatively high sediment retention. Accelerated sediment deposition caused by riparian or upstream disturbances can adversely affect spawning gravel quality in PA3 channel types. Important spawning beds are generally associated with zones of upwelling ground water in PA3 stream segments. Control of sediment sources should be a management emphasis (BMPs 13.11-13.13, 14.14).

Stream banks are generally composed of fine textured, unconsolidated alluvium which is sensitive to physical disturbance (BMPs 13.16, 14.13, 14.17).

Flood plain protection is an important management concern for PA3 channel types. These streams are associated with extensive wetland/flood plain complexes. PA3 channels help to buffer flows from extreme floods, store sediment and nutrients, and provide important fish habitat. Protection of these functions and values should be a principal management goal (BMPs 13.8, 13.15, 12.4, 12.6, 14.13).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

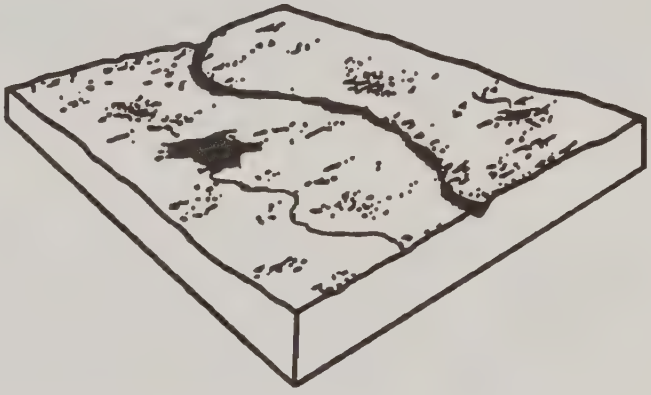
Sport Fish Potential..... LOW
Enhancement Opportunities ..... Spawning Channels

Provided that rearing areas are not at carrying capacity, production can be increased by constructing spawning channels in areas adjacent to PA3 channels. An abundance of alluvial gravels and upwelling groundwater are key features of PA3 channels that generally make them suited to development of spawning channels.

FLOOD PLAIN BACKWATER SLOUGH
Channel Mapping Symbol: PA4 (Formerly L5)

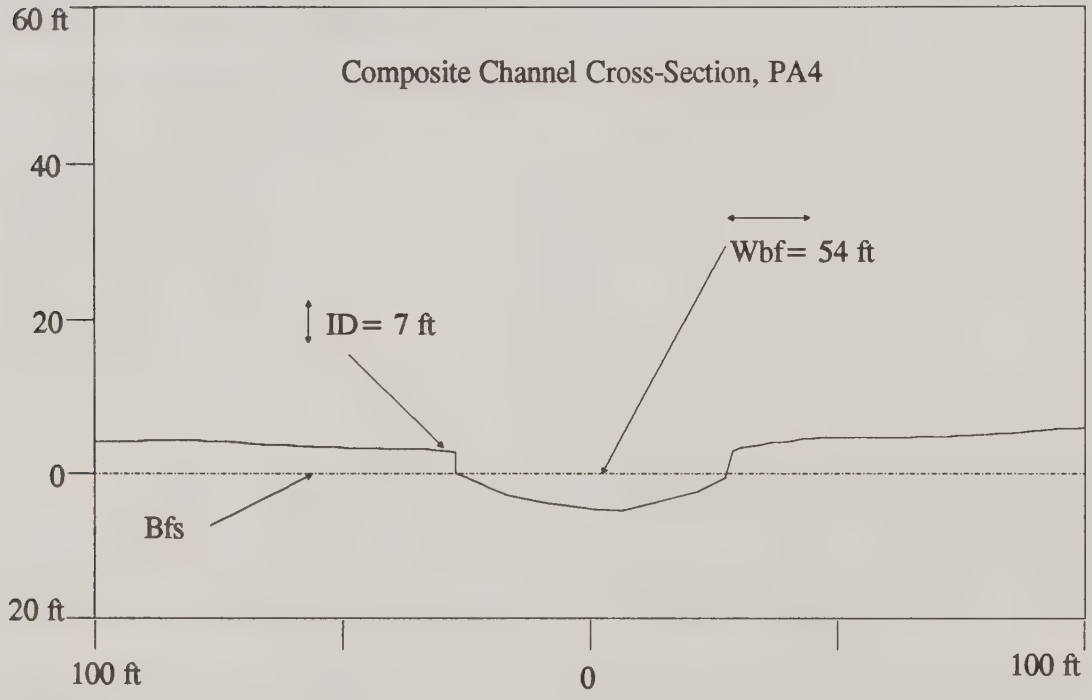
PHYSICAL CHARACTERISTICS

Geographic Setting: Glacial outwash flood plains and river terrace lowlands adjacent to active flood plains are associated with the PA4 channel.



Similar Channel Types: PA2, PA5

Channel Structure



Stream Gradient: .....0.0-1%, mean = 1%
Incision Depth: .....<4 m (13 ft), mean = 3 m (10 ft)
Bankfull Width:.....< or = 30 m (99 ft)
Dominant Substrate: .....Silt to fine gravel
Stream Bank Composition: .....Alluvium or organic mat
Sideslope Length: .....Not significant
Sideslope Angle: .....Not significant
Channel Pattern:.....Single, low velocity flow
Drainage Area: .....Variable

INCHANNEL PHOTO: PA4

Riparian Vegetation: The riparian plant community is dominated by nonforested plant communities, with the Sitka spruce series also being of significance. Nonforested plant communities are dominated by willow, Sitka alder, salmonberry, and devil's club shrub communities.

Plant Association Series	% Cover
Nonforest	80%
Sitka Spruce	16%
Sitka Spruce-Cottonwood	4%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: PA4 channels store sediment. Flow velocity is very sluggish and is controlled by backwater from main river channels. Fine silt sediment composes the bed substrate.

Aquatic Habitat Capability

Large Woody Debris ..... < 500 ft^3/1000 linear ft
Available Spawning Area (ASA).....N/A
Available Rearing Area (ARA).....Avg = 91% for 11 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	HIGH
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	LOW	HIGH
Chinook	NEG	LOW
Dolly Varden	LOW	LOW
Steelhead	NEG	NEG

PA4 channels are often accessible to anadromous species, but occasionally may be physically isolated from a stream network. Their slough-like characteristics render spawning capability insignificant, although coho, sockeye salmon, and Dolly Varden may have some success in isolated patches of gravel. Coho and sockeye salmon will frequently rear in these channels. Chinook salmon may also rear here temporarily, if accessible from large mainstem channels. Overwintering habitat can be significant if groundwater inflow is present. Pool area is 66 percent of the channel with an average mean depth of .61 meters (2.0 feet).

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	LOW
Sediment Retention	HIGH
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	N/A
Flood Plain Protection Need	HIGH
Culvert Fish Passage	N/A

Sediment retention in PA4 slough channels is high. These channels may also function as longer term sediment sinks when cut off from the main flood plain side channels. Increased sedimentation will likely have minor effects on spawning capability in PA4 channels, due to a lack of usable spawning gravels.

Stream banks are moderately sensitive to disturbance due to a high percentage of fine unconsolidated alluvium (BMP 12.7).

These channels are often associated with extensive flood plain/wetland complexes. PA4 channel types and adjacent riparian areas function as sediment and nutrient sinks, and are important buffers against extreme flood flows. Protection of these values and functions should be a primary management emphasis (BMPs 12.4, 12.6, 13.8, 13.15, 14.13).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

Riparian Management Opportunities:

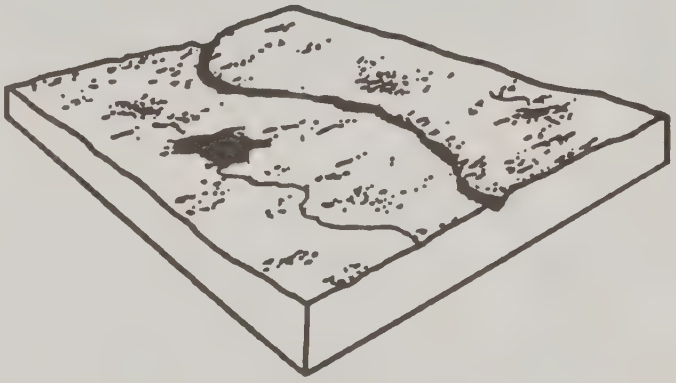
Sport Fish Potential..... LOW
Enhancement Opportunities ..... Spawning Channels

Provided that the rearing habitat is not at its carrying capacity, construction of spawning channels adjacent to PA4 channels may increase fish production. Flood plain gravels and near surface groundwater are key features often associated with PA4 channels, making them potentially suitable for spawning channel projects.

BEAVER DAM/POND CHANNEL
Channel Mapping Symbol: PA5 (Formerly L3)

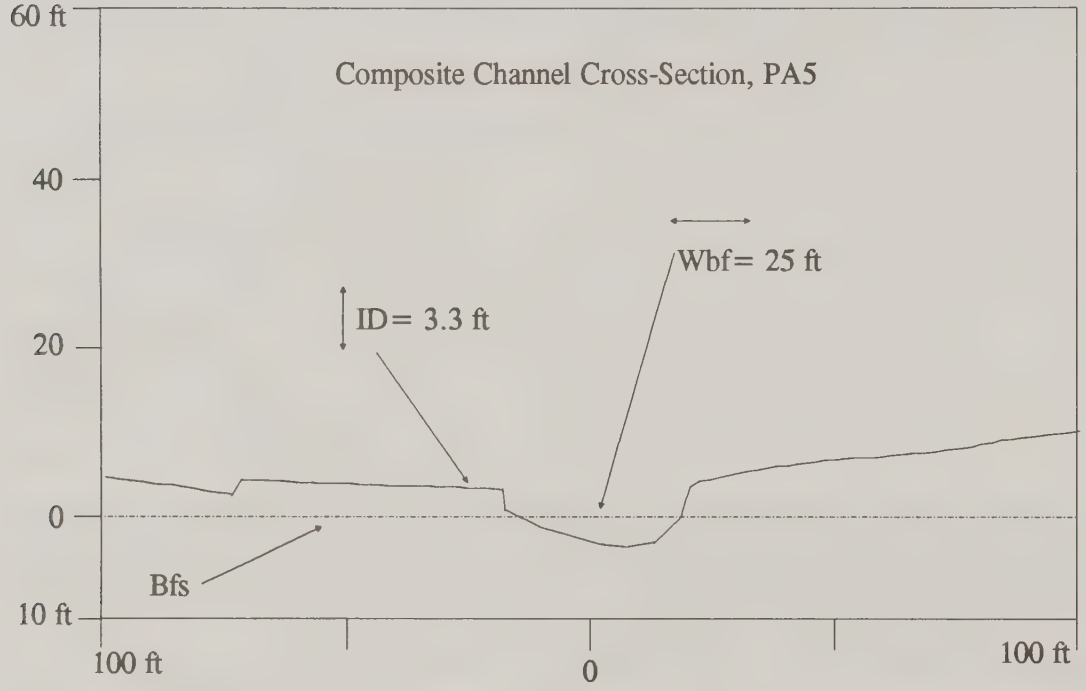
PHYSICAL CHARACTERISTICS

Geographic Setting: PA5 streams are found on valley bottom flood plains and low relief landforms. The PA5 channel type is characterized by a series of beaver impoundments.



Similar Channel Types: PA2, PA4

Channel Structure



Stream Gradient: .....0-1%, mean = 1%
Incision Depth: .....< or = 2 m (6.5 ft), mean = 1 m (3.3 ft)
Bankfull Width:.....Variable, normally >10 m (33 ft)
Dominant Substrate: .....Organic silt to sand
Stream Bank Composition: .....Organic material
Sideslope Length: .....N/A
Sideslope Angle: .....N/A
Channel Pattern:.....Ponded area, glide flow
Drainage Area: .....<25.9 km^2 (<10 mi^2)

INCHANNEL PHOTO: PA5

Riparian Vegetation: The riparian area is dominated by nonforested plant communities, with the Sitka spruce series and shore pine series also being significant. The nonforested plant communities are dominated by sedge and sphagnum bog communities.

Plant Association Series	% Cover
Nonforest	31%
Sitka Spruce	20%
Shore Pine	17%
Mixed Conifer	13%
Western Hemlock-Red Cedar	8%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: The PA5 channel is a sediment sink. Silt, sand, and fine gravel sediment particles are effectively trapped by these channel reaches. Typically the PA5 channels occur when valley flood plain channels (FP3, FP4) or palustrine glide channels (PA1) are worked by beavers. Flood peaks tend to be attenuated by these stream reaches. Substantial sediment loads may be delivered to downstream reaches in the wake of a beaver dam burst.

Aquatic Habitat Capability

Large Woody Debris ..... < 500 ft^3/1000 linear ft
Available Spawning Area (ASA).....N/A
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	HIGH
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	LOW	HIGH
Chinook	NEG	NEG
Dolly Varden	NEG	HIGH
Steelhead	NEG	NEG

These channels are moderately accessible to anadromous species. Spawning is limited by the sand, silt and organic muck content of the substrate. Sockeye salmon do spawn near areas of groundwater upwelling. PA5 channels provide good rearing habitat for coho, sockeye salmon, and Dolly Varden char. Good overwintering habitat is provided in the deep (mean depth = 0.55 meters [1.8 feet]) pools (78% of active water).

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	LOW
Sediment Retention	HIGH
Stream Bank Sensitivity	LOW
Sideslope Sensitivity	N/A
Flood Plain Protection	MOD
Culvert Fish Passage	N/A

The woody debris associated with beaver dam complexes provides extensive areas of cover for juvenile fish. In addition, these beaver dam complexes greatly increase production of invertebrates, upon which the juvenile fish feed.

Sediment retention is very high in PA5 beaver pond channels. These channels can buffer downstream sediment transport. Sedimentation behind beaver ponds gradually reduces available rearing habitat in these channels.

These channels are associated with important wetland/flood plain complexes. The PA5 channel stores sediment and nutrients, and buffers flows from extreme runoff events. Protection of wetlands functions and values is an important management consideration in PA5 channel types (BMPs 12.4-12.6, 13.8,13.15, 14.13).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

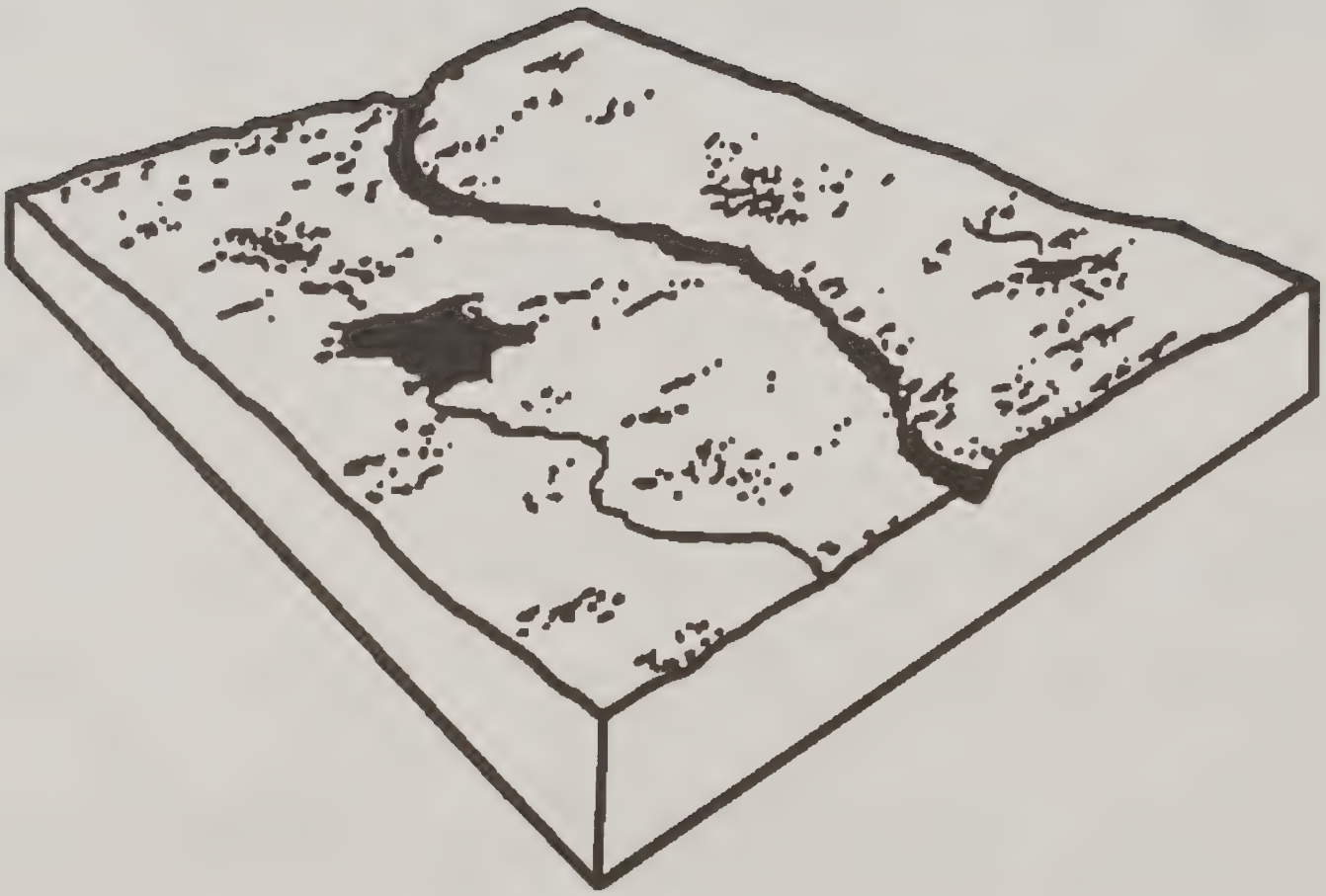
Riparian Management Opportunities:

Sport Fish Potential..... HIGH
Enhancement Opportunities ..... Beaver Introduction, Fry Stocking

PA5 channels provide good sport fishing opportunities especially when these channels are tributary to large flood plain rivers. Primary species of interest include Dolly Varden char and cutthroat trout.

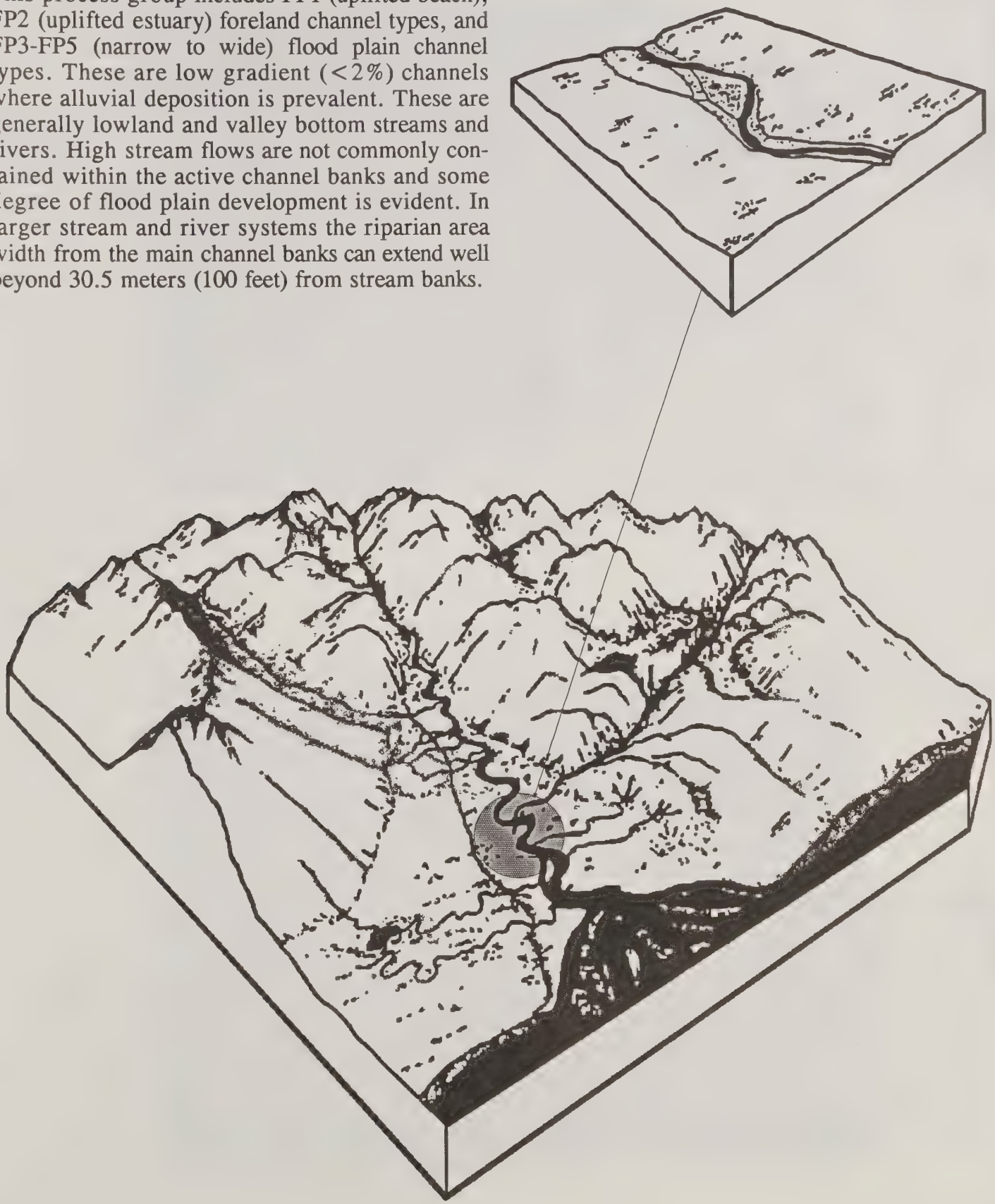
Provided that they are not at carrying capacity, PA5 channels can be stocked with fry to increase production. Beaver populations should be managed to maintain optimum fish rearing capability and sufficient food source for beaver.

Palustrine Process Group



FLOOD PLAIN PROCESS GROUP

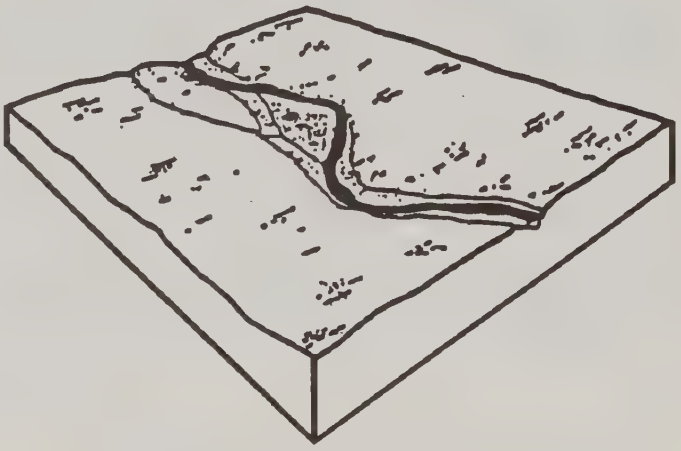
This process group includes FP1 (uplifted beach), FP2 (uplifted estuary) foreland channel types, and FP3-FP5 (narrow to wide) flood plain channel types. These are low gradient (<2%) channels where alluvial deposition is prevalent. These are generally lowland and valley bottom streams and rivers. High stream flows are not commonly contained within the active channel banks and some degree of flood plain development is evident. In larger stream and river systems the riparian area width from the main channel banks can extend well beyond 30.5 meters (100 feet) from stream banks.



UPLIFTED BEACH CHANNEL
Channel Mapping Symbol: FP1 (Formerly C4)

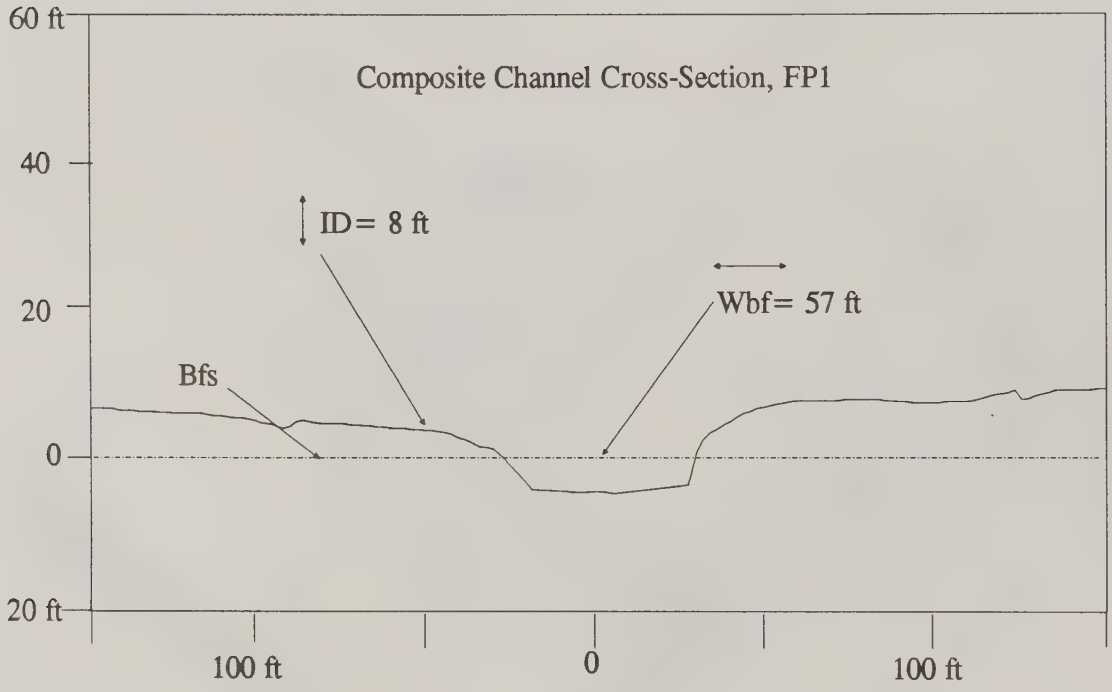
PHYSICAL CHARACTERISTICS

Geographic Setting: FP1 streams occur on near shore areas of glacial forelands. These channels tend to flow parallel to the coastline and occupy depressions between relic beach dune deposits. These streams are found in lower reaches of drainage systems, upland from current estuaries or shorelines.



Similar Channel Types: FP4.6, FP5.6

Channel Structure



Stream Gradient: .....<1%, mean = 0.5%
Incision Depth: .....< or = 3 m (10 ft), mean = 2.5 m (8 ft)
Bankfull Width:.....>12 m (40 ft), mean = 17 m (57 ft)
Dominant Substrate: .....Silt, sand and fine gravel
Stream Bank Composition: .....Fine alluvium
Sideslope Length: .....Not significant, flat landform associated
Sideslope Angle: .....Not significant
Channel Pattern:.....Single, sinuous
Drainage Basin Area:.....26-52 km^2 (10-20 mi^2)

INCHANNEL PHOTO: FP1f

INCHANNEL PHOTO: FP1s

Riparian Vegetation: The dominant riparian plant associations for the FP1 channel type are distinguished by two phases, FP1f and FP1s. The FP1f riparian vegetation is predominantly Sitka spruce/salmonberry plant association, with a significant component of nonforest plant communities. The FP1s riparian vegetation is predominantly nonforested plant communities composed of Sitka alder, willow, and meadow communities.

Plant Association Series	% Cover FP1f	FP1s
Sitka Spruce	83%	19%
Nonforest	17%	81%

Channel Type Phases:

- ☐ FP1f - FORESTED PHASE has a dominant Sitka spruce riparian vegetation component, however, willow/alder shrub species predominate along the channel margins. This vegetation pattern limits potential large woody debris recruitment to these streams.
- ☐ FP1s - SHRUB PHASE has extensive willow/alder shrub communities in the riparian zone.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: These are depositional channels that tend to retain a high proportion of fine sediments. FP1 streams are low energy due to very low stream gradient and poor flow containment. Only fine organic and silt particle fractions tend to flush through these systems during high flow events.

Aquatic Habitat Capability

Large Woody Debris ..... < 100 ft^3/1000 linear ft
Available Spawning Area (ASA) .....Insufficient data
Available Rearing Area (ARA) .....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	HIGH
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	LOW	LOW
Chinook	NEG	NEG
Dolly Varden	LOW	MOD
Steelhead	NEG	NEG

FP1 channels are always accessible to anadromous species. Substrates are generally too fine to allow significant spawning success, though some spawning habitat is available. Rearing habitat is considerable and may get moderate use by coho salmon and Dolly Varden char, especially when in association with streamside vegetation cover, and occasional use by sockeye. These channels have potential for providing overwintering habitat for coho.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....MOD
Sediment Retention .....HIGH
Stream Bank Sensitivity.....HIGH
Sideslope Sensitivity.....N/A
Flood Plain Protection Needs .....MOD
Culvert Fish Passage .....LOW

Large wood is generally not a major habitat component in FP1 channels due to the nature of vegetation succession in the settings where these channels occur. Most vegetation adjacent to FP1 channel types are composed of meadow or shrub species in relic dune depressions, while spruce stands occupy former dune crests. Infrequently, spruce stands border FP1 stream banks. Input of large woody debris can provide important pool habitat and cover for rearing fish in these cases.

Sediment retention is a concern in these streams. Riparian management emphasis should be placed on erosion control practices (BMPs 12.17, 14.13, 14.9, 13.11-13.13).

Stream bank sensitivity is high due to the predominance of sand banks. Shrub and meadow root mats are very important for maintaining stream bank structure. Protection of stream bank integrity is an important riparian management consideration (BMPs 12.7, 13.16, 14.17).

Protection of high value wetlands commonly associated with FP1 riparian areas is a primary management concern (BMPs 12.4-12.6, 13.15).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is also an important riparian management concern (BMP 14.14).

Riparian Management Opportunities:

Sport Fish Potential.....HIGH
Enhancement Opportunities .....Large Wood Placement, Spawning Channels

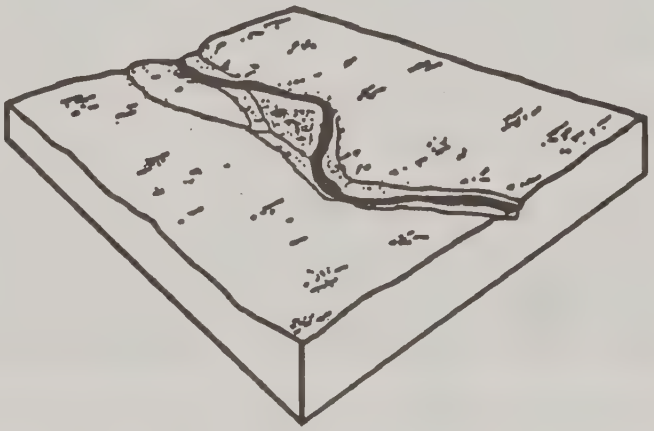
These channels offer excellent sport fish potential. Access by foot from the beach or by small boat is generally good. Deep pools at meanders and reaches influenced by tidal backwater provide the best angling opportunities.

Where suitable material exists in proximity to the channel, placement of large woody debris can be used to increase cover and rearing area for juvenile fish. FP1 channel segments have limited spawning habitat due to sandy substrate. Upland tributaries with groundwater recharge and gravel substrate may be suitable for spawning channel projects.

FORELAND UPLIFTED ESTUARINE CHANNEL
Channel Mapping Symbol: FP2 (Formerly C6 and B8)

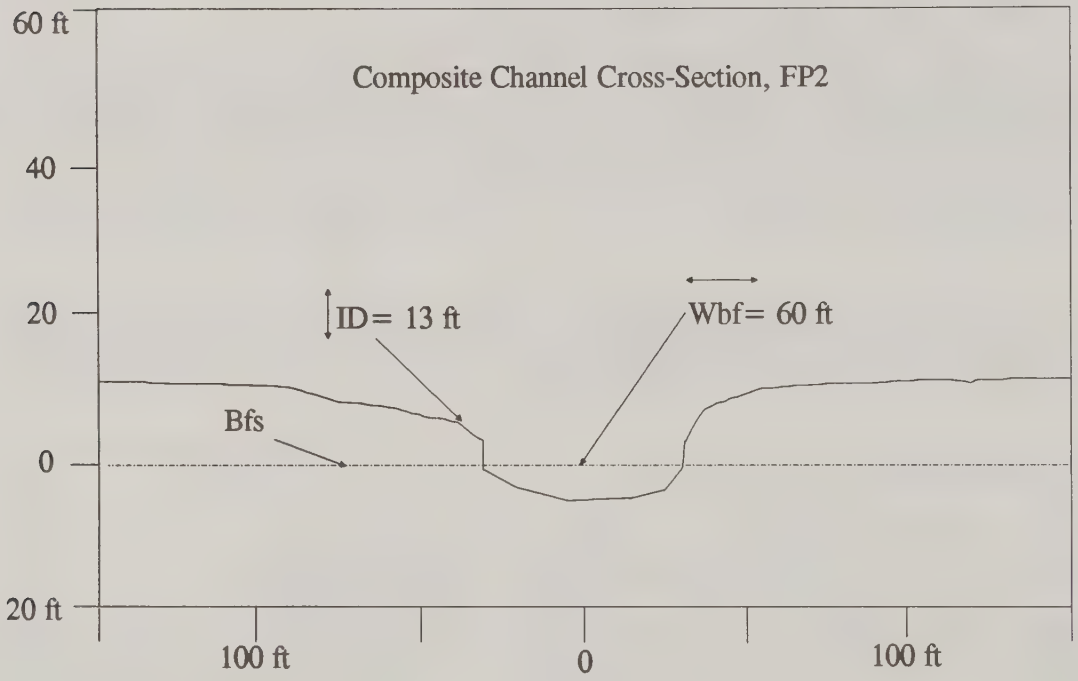
PHYSICAL CHARACTERISTICS

Geographic Setting: The FP2 stream is found on uplifted estuaries, prevalent in recently deglaciated forelands and large mainland river deltas.



Similar Channel Types: FP1, ES4

Channel Structure



Stream Gradient: .....<1%, mean = 0.5%
Incision Depth: .....<6 m (20 ft), mean = 4 m (13 ft)
Bankfull Width:.....Variable, mean = 18 m (60 ft)
Dominant Substrate: .....Silt to fine gravel
Stream Bank Composition: .....Silt
Sideslope Length: .....<5 m (16.5 ft), mean = 3 m (10 ft)
Sideslope Angle: .....Mean = 34% (19 degrees)
Channel Pattern:.....Single, sinuous
Drainage Basin Area:.....26-52 km^2 (10-20 mi^2)

INCHANNEL PHOTO: FP2s

Riparian Vegetation: The riparian plant associations for FP2 stream are distinguished by two phases, FP2f and FP2s. Nonforest plant communities commonly found in riparian areas associated with both phases include sedge, sphagnum, and sweet gale bog communities.

Plant Association Series	% Cover	
	FP2f	FP2s
Sitka Spruce	50%	30%
Nonforest	50%	70%

Channel Type Phases:

- ☐ FP2f - FORESTED PHASE riparian vegetation has co-dominant spruce and nonforest plant communities. Inchannel large woody debris recruitment is a significant factor influencing fish rearing capability in some channel reaches.
- ☐ FP2s - NONFOREST PHASE riparian vegetation is dominantly shrub and muskeg bog plant communities.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: FP2 channels have low stream energy due to very low channel gradient and a lack of flow containment. The high silt content of the FP2 stream bed and banks, and the proximity to glacial outwash channels, result in a characteristically high, suspended sediment load. Significant amounts of inchannel fine sediment storage can occur in pools and sand bars.

Aquatic Habitat Capability

Large Woody Debris ..... < 1000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	MOD
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	LOW	LOW
Chinook	NEG	NEG
Dolly Varden	LOW	MOD
Steelhead	NEG	NEG

FP2 channels are always accessible to anadromous species. Substrates are composed predominantly of sand and silt (88%) which limits spawning capability for salmonid species. These channels provide some rearing potential, with moderate use by coho salmon and Dolly Varden char, and occasional use by sockeye salmon. FP2 channels may provide some overwintering habitat, especially when large woody debris is present, however, large woody debris recruitment is low in these streams.

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	LOW
Sediment Retention	HIGH
Stream Bank Sensitivity	HIGH
Sideslope Sensitivity	N/A
Flood Plain Protection	MOD
Culvert Fish Passage	MOD

Large wood influence on channel morphology and fish habitat is generally low for this channel type due to the geographic setting. These channels are found on uplifted coastal embayments that are dominated by muskeg vegetation types.

Sediment retention is naturally high for gravel and sand size material, however, sediment inputs generally have limited effects on habitat in FP2 channels, due to little available spawning habitat.

Stream banks are composed of relatively cohesive silt particles. This material has relatively low bearing strength and is susceptible to earth flow type failures if physically disturbed. This can create problems for bridge design and installation of road crossings (BMPs 13.16, 14.2, 14.3, 14.17).

Protection of important wetland values and functions is an important management consideration for FP2 riparian areas (BMPs 12.4-12.6, 13.15).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential..... HIGH
Enhancement Opportunities ..... Large Wood Placement, Spawning Channels

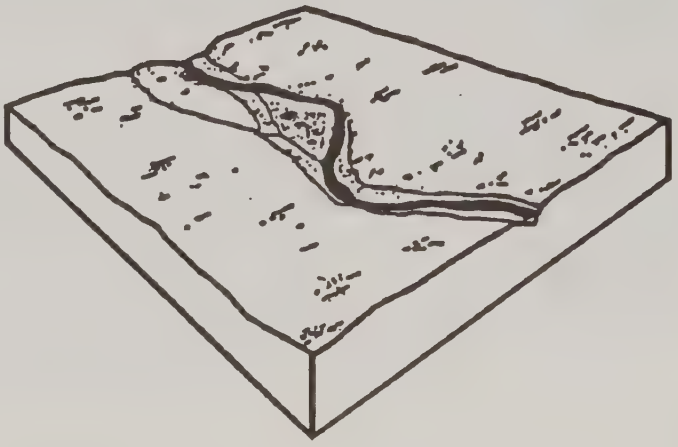
These channels are generally accessible by small boat. Primary sport species are coho salmon and Dolly Varden char. Banks with overhanging shrubs and deep meander bend pools offer the best angling opportunities.

Where local sources of large wood are available, insertion of wood habitat structures can improve cover and pool habitat in FP2 channels. FP2 channel segments are typically spawning limited. Opportunities to develop spawning channels in upland tributary channels, having gravel substrate and ample groundwater recharge, can be explored, provided that existing rearing habitat is not already at its carrying capacity.

NARROW LOW GRADIENT FLOOD PLAIN CHANNEL
Channel Mapping Symbol: FP3 (Formerly B1)

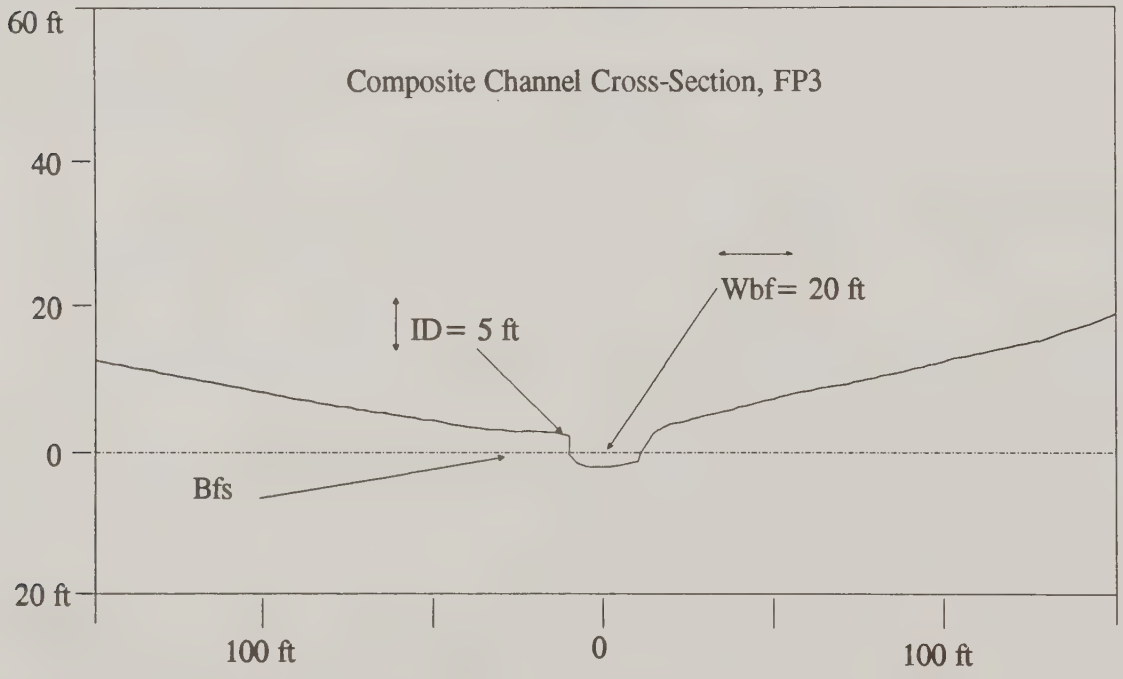
PHYSICAL CHARACTERISTICS

Geographic Setting: FP3 streams are located in the valley bottoms and may also occur within flat lowlands or low elevation drainage divides. Frequently, FP3 streams lie adjacent to the toe of footslopes or hillslopes, adjacent to main trunk, valley bottom channels. The flood plain of large, low gradient alluvial channels (FP4 or FP5) may be dissected by FP3 streams. Where FP3 streams occur parallel to footslopes or in valley bottom locations, they are typically fed by high gradient streams. In small drainage basins, HC3 or MM1 channels may directly precede a FP3 stream. Less frequently, FP3 streams are situated on mountainslope benches.



Similar Channel Types: MM1, AF1

Channel Structure



Stream Gradient: .....< or = 2%, mean = 1%
Incision Depth: .....< or = 2 m (6.5 ft), mean = 1.5 m (5 ft)
Bankfull Width:.....<10 m (33 ft), mean = 6 m (20 ft)
Dominant Substrate: .....Sand to small rubble
Stream Bank Composition: .....Sand to coarse gravel
Sideslope Length: .....Not significant, flat flood plain landform adjacent
Sideslope Angle: .....Not significant
Channel Pattern:.....Single to multiple channels, sinuous
Drainage Basin Area:.....2.59-13 km^2 (1-5 mi^2)

INCHANNEL PHOTO: FP3

Riparian Vegetation: The riparian plant associations for FP3 and FP3f are dominated by the Sitka spruce series and the western hemlock series. Salmonberry and alder shrub communities are the principal nonforest riparian plant communities, which are dominant in the FP3m and FP3s channel type phases. Willow shrub and sedge/sphagnum bog communities are the primary nonforest riparian communities in the FP3m phase. Sitka alder and willow shrub communities are the predominant riparian vegetation associated with the FP3s phase.

Plant Association Series	**% Cover**			
	FP3	**FP3m**	**FP3f**	**FP3s**
Sitka Spruce	36%	---	82%	3%
Western Hemlock	23%	---	---	---
Mixed Conifer	16%	---	---	---
Shore Pine	---	11%	---	---
W.Hemlock/Red Cedar	11%	14%	---	---
Nonforest	7%	75%	17%	90%

Channel Type Phases:

- ☐ FP3a - VOLCANIC ASH PHASE is primarily restricted to Kruzof Island. Stream bank composition is influenced by poorly consolidated volcanic ash and breccias. Stream bank and sideslope sensitivity may be higher than is typical for this channel type.
- ☐ FP3m - MUSKEG VEGETATION/GRAVEL SUBSTRATE PHASE is characterized by muskeg/scrub forest riparian vegetation. Fish spawning and rearing habitat capabilities may be lower than is typical for this channel type.
- ☐ FP3f - FORELAND OUTWASH FORESTED PHASE is influenced significantly by groundwater influx from shallow alluvial aquifers. Fish habitat capability may be higher than is typical for this channel type due to temperature moderation by groundwater.

- ☐ FP3s - FORELAND OUTWASH SHRUB PHASE is significantly influenced by groundwater inflow. Rearing habitat capability may be less than FP3f (FORELAND OUTWASH FORESTED PHASE) due to a lack of large woody debris input, and, as a consequence, less pool structure and cover habitat.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: FP3 channels function as sediment deposition systems. Sediment routed from high and moderate gradient sediment transport channels is temporarily stored in this channel and on the adjacent flood plain. Sand and fine gravel deposits in point bars and pools are dominant streambed features. Sensitive stream banks, constantly affected by constructive and erosive forces, also contribute to the sediment load in FP3 channels. Large woody debris accumulations are frequent and retain significant volumes of fine sediment. Stream power is low, allowing for massive mobilization of sediment only during peak flow events.

Aquatic Habitat Capability

Large Woody Debris .....4000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 21% for 53 sites
Available Rearing Area (ARA).....Avg = 49% for 53 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	HIGH	HIGH
Pink	MOD	NEG
Chum	MOD	NEG
Sockeye	HIGH	NEG
Chinook	LOW	LOW
Dolly Varden	HIGH	HIGH
Steelhead	MOD	HIGH

These channels are frequently accessible to anadromous species. Coarse and fine gravels compose 49% of the substrate, therefore, ASA is high (30%). These channels receive moderate to high spawning use by all anadromous species, with the exception of chinook salmon. Resident fish in lakes also use adjacent FP3 channels for spawning. When located next to accessible lakes, these channels provide excellent spawning habitat for sockeye salmon, steelhead, or sea-run cutthroat trout. FP3 channels have a large amount (51%) of ARA and are used extensively by coho, Dolly Varden, and steelhead. Thirty-seven percent of the active water in pools has an average depth of 0.31 meters (1.02 feet), which provides good overwintering habitat. Woody debris and beaver dams enhance these pools as overwintering areas.

Riparian Management Considerations

Concern for Management of:
Large Woody Debris .....HIGH
Sediment Retention .....HIGH
Stream Bank Sensitivity.....MOD
Sideslope Sensitivity.....N/A
Flood Plain Protection.....MOD
Culvert Fish Passage.....MOD

Large woody debris has a significant influence on FP3 channel structure by increasing the frequency and size of pool structures. Large woody debris helps form scour pools. The cover provided by large woody debris greatly improves rearing habitat.

Sediment retention in FP3 channel segments is high. These channel are often associated with a large flood plain complex and may be influenced by flooding of adjacent mainstem rivers. Increased sediment loading in these channels or in upstream channels could adversely impact spawning gravels. Riparian management should emphasize measures that reduce the potential for erosion and stream bank disturbance (BMPs 13.11-13.13, 13.16, 14.9-14.11).

Stream banks are composed of coarse to fine textured alluvium, which, due to low stream flow volume and relatively low stream power, are only moderately sensitive to disturbance.

Generally, flood plains for FP3 channels are narrow. However, the channels are often associated with large mainstem river flood plain complexes.

Concern for providing fish access through culvert structures in FP3 channel types is moderate. Improperly installed or poorly designed culverts can restrict juvenile and adult fish passage by creating velocity barriers or bed scour at culvert outlets (BMP 14.17). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

These are typically classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

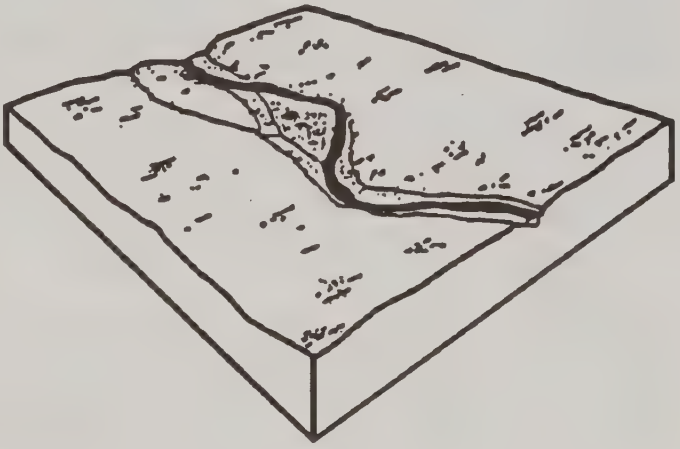
Sport Fish Potential.....LOW
Enhancement Opportunities .....Large Wood Placement, Beaver Introduction

Generally, FP3 channel types offer excellent opportunities to improve available rearing habitat through placement of large woody debris. Enhancement efforts can focus on overwintering habitats. These channels also contain habitat which is characteristically preferred by beaver. Encouragement of beaver colonization can greatly expand fish rearing potential in FP3 streams.

LOW GRADIENT FLOOD PLAIN CHANNEL
Channel Mapping Symbol: FP4 (Formerly C1)

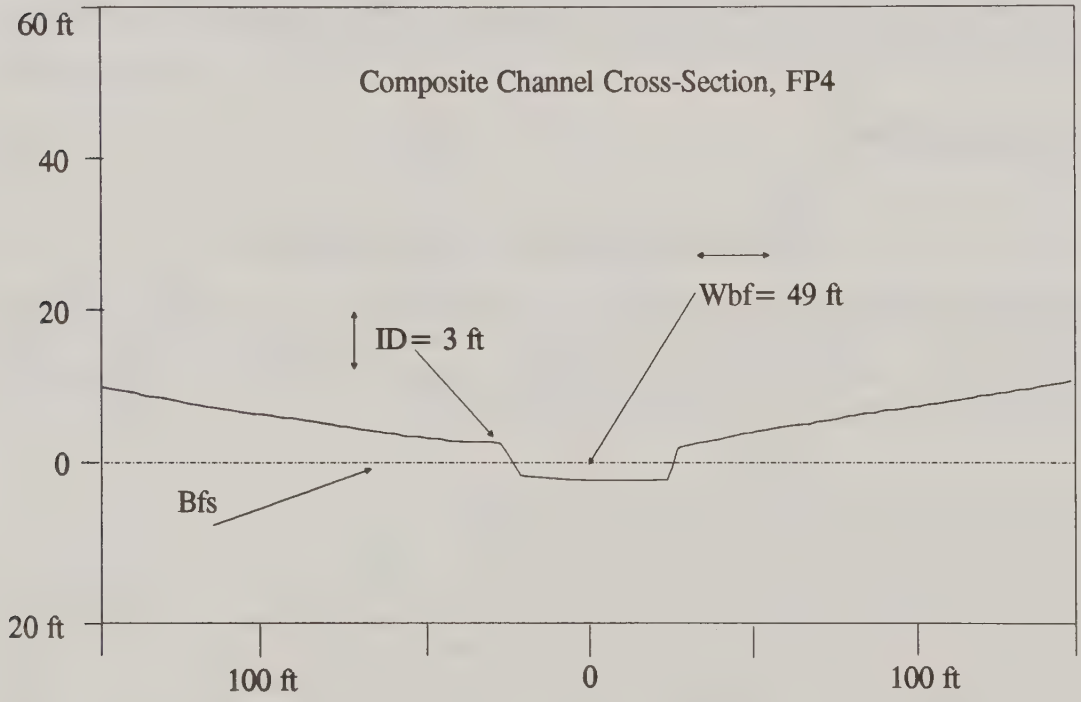
PHYSICAL CHARACTERISTICS

Geographic Setting: FP4 channels are mainstem streams in broad valley bottoms that generally have extensive flood plains. Alluvial fans, dissected footslopes, and hillslope and lowland landforms may directly abut FP4 flood plains. FP4 channels are typically sinuous, with extensive gravel bars, multiple channelways, and alluvial terraces. These channels are typically at the lower end of the stream and, therefore, have large drainage basins.



Similar Channel Types: FP3, FP5

Channel Structure



Stream Gradient: .....<2%, mean = 1%
Incision Depth: .....< or = 2 m (6.5 ft), mean = 1 m (3 ft)
Bankfull Width:.....10-20 m (33-66 ft), mean = 15 m (49 ft)
Dominant Substrate: .....Sand to cobble
Stream Bank Composition: .....Alluvium
Sideslope Length and Angle:.....Associated with a flat flood plain landform
Channel Pattern:.....Single to multiple channels, sinuous
Drainage Basin Area:.....13-39 km^2 (5-15 mi^2)

INCHANNEL PHOTO: FP4

Riparian Vegetation: The riparian plant communities for the FP4 channel type and the FP4l phase are dominated by the Sitka spruce series and the western hemlock series. Common nonforest shrub communities include salmonberry, red alder, Sitka alder, devil's club, and willow. The nonforested communities are of most significance in the FP4f and FP4s phases. The shore pine/crowberry plant association is significant in the FP4m phase. The predominant nonforest plant community in this phase is sedge/sphagnum. Sitka alder, salmonberry, and willow shrub communities are the dominant riparian plant communities for these phases.

Plant Association Series	% Cover				
	FP4	FP4l	FP4m	FP4f	FP4s
Sitka Spruce	51%	44%	14%	35%	3%
Western Hemlock	23%	27%	7%	9%	---
Nonforest	13%	18%	37%	42%	97%
Mixed Conifer	7%	4%	5%	---	---
Shore Pine	---	---	24%	---	---
Sitka Spruce-Cottonwood	---	---	---	14%	---

Channel Type Phases:

- ☐ FP4a - VOLCANIC ASH PHASE is limited geographically to drainage basins heavily affected by geologically recent volcanic deposits. Stream bank and substrate composition is predominantly scoria and ash particles deposited by multiple volcanic eruptions.
- ☐ FP4l - LARGE SUBSTRATE PHASE has greater stream power than a typical FP4 channel, thus functioning as a more efficient sediment transporter. Substrate usually is somewhat larger, and large woody debris has less influence on channel dynamics.
- ☐ FP4m - MUSKEG PHASE is typified by low gradient, muskeg or meadow channels. However, significant fine gravel, sand, and silt deposition and transport occur in this phase, making these channels more similar to the Flood Plain Process Group versus those channels categorized in the Palustrine Process Group.

- ☐ FP4f - FORELAND, OUTWASH, FORESTED PHASE includes alluvial flood plain channels that are set apart by predominant groundwater recharge. This phase is restricted to coastal foreland landforms with early successional Sitka spruce riparian stands.
- ☐ FP4s - FORELAND, OUTWASH, SHRUB PHASE includes foreland groundwater streams with shrub or muskeg riparian vegetation.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: FP4 channels are characterized by temporary fine sediment storage associated with deposition in pools and point bars, and on flood plains. Bank erosion and bank building processes are continually at work resulting in very dynamic and diverse channel morphology. Channel gradient is low and flow containment is poor resulting in relatively low stream power. Sand and fine gravel constitute a large percentage of the substrate material. Large woody debris is also a major component influencing sediment entrapment and channel morphology. Stored sediments are mobilized and transported downstream during high flow events.

Aquatic Habitat Capability

Large Woody Debris .....9000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 24% for 62 sites
Available Rearing Area (ARA).....Avg = 35% for 62 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	HIGH	HIGH
Pink	HIGH	NEG
Chum	HIGH	NEG
Sockeye	HIGH	NEG
Chinook	MOD	MOD
Dolly Varden	HIGH	HIGH
Steelhead	HIGH	HIGH

Rearing area is high (35%) in FP4 channels, due in part to large accumulations of woody debris. The majority of large wood pieces are in the 45.7-101.6 centimeter (18-40 inch) diameter classes and are distributed uniformly throughout the length of the stream. Winter habitat can be significant in side channel pools and where woody debris creates deep pools and low stream velocity. Woody debris and associated pool habitat is very important to both rearing juvenile and migrant adult salmonids. Undercut alluvial banks and root mats from riparian forest vegetation also provides rearing habitat. Rearing habitat diversity is enhanced by the frequent occurrence of sloughs, beaver ponds, and very small groundwater tributaries associated with FP4 channels.

Available spawning area is very high for FP4 channels because of the gravel to cobble size substrate.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....HIGH
Sediment Retention .....HIGH
Stream Bank Sensitivity.....HIGH
Sideslope Sensitivity.....N/A
Flood Plain Protection.....HIGH
Culvert/Fish Passage .....HIGH

Large wood accumulations are important factors in shaping FP4 channel morphology. Inchannel woody debris volume is usually high and distributed throughout most forested FP4 channel segments. Flood flows are capable of redistributing debris to a limited extent in these channels. Most stable woody debris is in the 45.7-76.2 centimeter (18-30 inch) diameter class and 15.2-30.4 meters (50-100 feet) length category. Maintenance of fish habitat capability is very dependent on continuous input of large, stable woody debris over time (BMP 12.6).

These low gradient depositional channels are sensitive to sediment introduction from headwater areas, and retention of fine gravel and sand size sediment is high. Therefore, these channels are susceptible to cumulative sediment impacts on fish habitat. Stream banks are composed of fine alluvium and are susceptible to erosion. Removal or disturbance of stream bank vegetation and root mats can result in accelerated bank erosion and breakdown of undercut bank habitat. Riparian management prescriptions should emphasize erosion control (BMPs 13.11-13.13, 14.9, 14.11, 14.13), stream bank protection (BMPs 13.16 and 14.17), and control of inchannel operations (BMP 14.14).

These channels are generally associated with extensive and complex riparian areas that include such features as sloughs, side channels, beaver pond complexes, and small spring fed tributary channels. Riparian area protection (BMPs 12.4, 12.6, 13.15, 14.13) is very important for maintaining water quality and rearing habitat associated with FP4 channels.

Stream crossings for FP4 channels are normally bridges. Culvert installation on small flood plain tributary channels (often not mapped) must provide for upstream juvenile fish passage (BMP 14.17).

These are typically classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential..... HIGH
Enhancement Opportunities ..... Large Wood Placement, Fry Stocking, and Spawning Channels

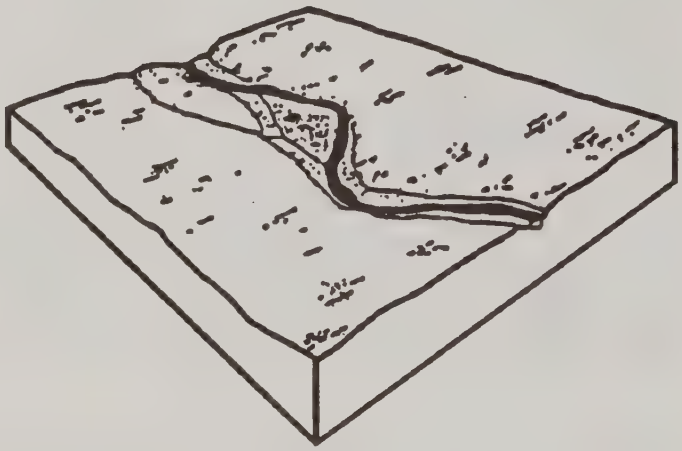
These channels offer excellent sport fish opportunities, primarily Dolly Varden, coho salmon, pink salmon, and steelhead trout. Deep pools along meander bends and associated with large log jams offer the best angling. Access by small boat to the channel itself is limited due to low water levels in the summer and numerous log jam obstructions.

A variety of enhancement opportunities exist for FP4 channels. Large woody debris projects could be evaluated where rearing habitat is limited. Fry stocking could be done when downstream fish barriers have been eliminated or laddered. Construction of flood plain spawning channels is a potential enhancement opportunity where shallow groundwater sources are present.

WIDE LOW GRADIENT FLOOD PLAIN CHANNEL
Channel Mapping Symbol: FP5 (Formerly C3)

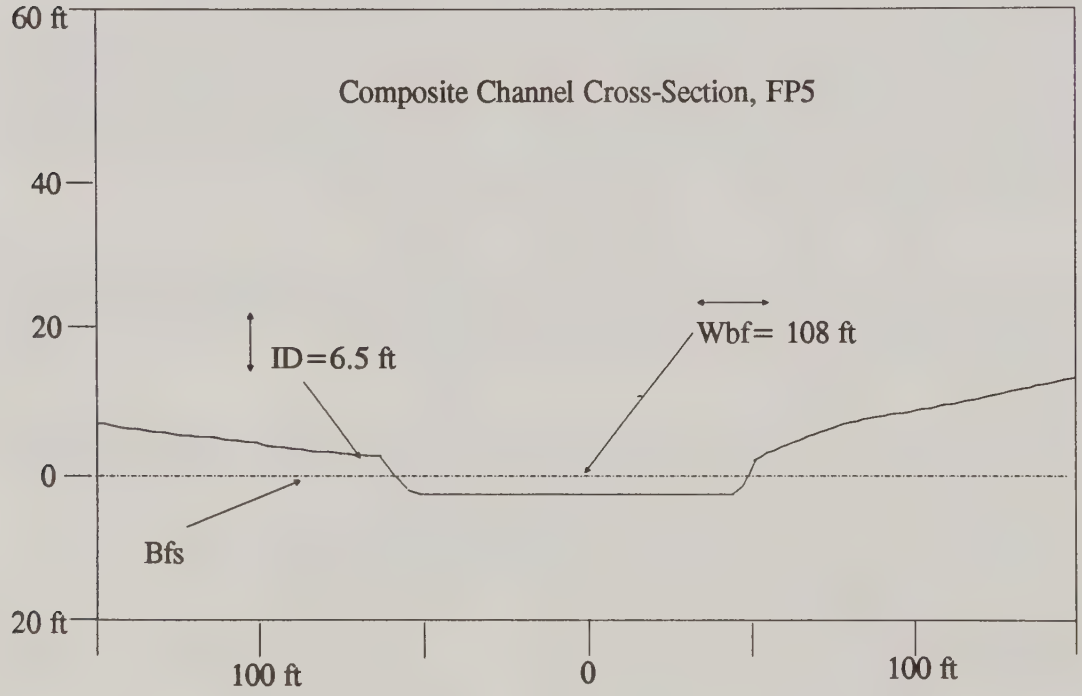
PHYSICAL CHARACTERISTICS

Geographic Setting: FP5 channels are usually found in broad valley bottoms of large to very large watersheds. Normally, these channels have extensive valley flood plains and river terraces. Smooth meander bends, numerous overflow side channels, extensive gravel bars, and large clumps of log jams are characteristic of this channel type.



Similar Channel Types: FP4, LC1, ES4

Channel Structure



Channel Gradient:.....<2%, mean = 1%
Incision Depth: .....< or = 3 m (10 ft), mean = 2 m (6.5 ft)
Bankfull Width:.....>20 m (66 ft), mean = 38 m (108 ft)
Dominant Substrate: .....Sand to cobble
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant, flat, flood plain landform associated
Sideslope Angle: .....Not significant
Channel Pattern:.....Single to multiple channels, sinuous
Drainage Basin Area:.....39-78 km^2 (15-30 mi^2)

INCHANNEL PHOTO: FP5

Riparian Vegetation: The FP5 riparian communities are dominated by the Sitka spruce series, the western hemlock series, and nonforested communities. The most common nonforested communities are Sitka alder, willow, and salmonberry shrub communities.

Plant Association Series	% Cover					
	FP5	**FP5l**	**FP5b**	**FP5m**	**FP5f**	**FP5s**
Sitka Spruce	49%	38%	37%	28%	56%	15%
Nonforest	23%	54%	6%	44%	37%	79%
Western Hemlock	23%	---	41%	5%	6%	---
W.Hemlock-Red Cedar	---	3%	13%	---	---	---
Mixed Conifer	2%	3%	3%	8%	---	---
Sitka Spruce-Cottonwood	---	---	---	2%	---	4%
Shore Pine	---	---	---	13%	---	---

Channel Type Phases:

- ☐ FP5l - LARGE SUBSTRATE PHASE has greater stream power than the typical FP5 and is a more efficient sediment transport system. Substrate has a larger mean diameter than in the typical FP5 channel.
- ☐ FP5m - MUSKEG PHASE includes riparian vegetation consisting of muskeg and meadow interspersed with individual trees and some forest. This is an alluvial channel with significantly greater sediment transport than Palustrine Process Group channels that often have similar riparian plant communities.
- ☐ FP5f - FORELAND OUTWASH FORESTED PHASE are alluvial channels that are strongly influenced by groundwater recharge from shallow aquifers. This phase is restricted to coastal foreland landforms. Sitka spruce communities dominate the riparian vegetation.
- ☐ FP5s - FORELAND OUTWASH SHRUB PHASE are groundwater fed, coastal foreland channels, with predominantly nonforested riparian plant communities.

☐ FP5b - BEDROCK INFLUENCE PHASE have mixed bank control associated with occasional bedrock outcrops.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: The FP5 channels function as sediment deposition systems. Low gradient, poor flow containment, and fine sized substrate are indicative of low stream power. Substrate consists mainly of sand to small cobble size particles. Short term storage of fine sediment is characteristic of FP5 channels. These fine sediment deposits are typically mobilized during high flow events. Small side channels dissecting the FP5 flood plain are a common feature.

Aquatic Habitat Capability

Large Woody Debris .....4000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 27% for 56 sites
Available Rearing Area (ARA).....Avg = 29% for 56 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	HIGH	HIGH
Pink	HIGH	NEG
Chum	HIGH	NEG
Sockeye	HIGH	NEG
Chinook	HIGH	HIGH
Dolly Varden	HIGH	HIGH
Steelhead	HIGH	HIGH

FP5 channels are heavily used by spawning chinook, chum, and pink salmon, and steelhead trout because of the abundance of high quality spawning gravels. These channels get only moderate use by spawning coho salmon which prefer smaller channels. All freshwater rearing species make frequent use of these channels because rearing habitat is readily available, primarily in association with side channels, off-channel pools, and stream segments having large woody debris accumulations. Overwintering habitat in these channels is provided in off-channel slough areas and pools associated with large woody debris.

Riparian Management Considerations

Concern for Management of:
Large Woody Debris .....HIGH
Sediment Retention .....HIGH
Stream Bank Sensitivity.....HIGH
Sideslope Sensitivity.....N/A
Flood Plain Protection.....HIGH
Culvert/Fish Passage .....N/A

Maintaining future sources of woody debris is an important consideration in FP5 channels. Natural large woody debris volumes are moderately high, but, generally, inchannel wood accumulations are less stable than in smaller FP4 channels due to higher flood flows in FP5 channel types.

Retention of fine sediment (sand, gravel) is often high in FP5 channels, therefore, these channels may be sensitive to cumulative sediment inputs from headwater sources. Excessive sediment loads can degrade spawning gravel quality and, in extreme cases, can disrupt sediment transport equilibrium and channel stability. Removal or disturbance of stream bank vegetation can accelerate bank erosion and the subsequent loss of undercut bank rearing habitat. Riparian management should emphasize stream bank protection and erosion control measures to minimize potential sediment sources (BMPs 13.11-13.13, 13.16, 14.9-14.11).

Flood plain protection is a very important management consideration for FP5 channels because of off-channel features which contribute to juvenile fish rearing habitat (BMPs 12.4, 12.6, 13.8, 14.13). These off-channel flood plain features include small spring fed tributaries, sloughs, beaver pond complexes, and side channels.

The location and design of stream crossing structures is an important consideration due to the large size and natural instability of the channels and associated flood plains (BMPs 14.2, 14.3, 14.17, 14.14). Large multi-span bridges are often required to cross these channels. Roadways traversing flood plain tributaries must provide for juvenile fish migration through culverts.

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is an important riparian management concern for these streams (BMP 14.14).

Riparian Management Opportunities:

Sport Fish Potential.....HIGH

Enhancement Opportunities .....Large Wood Placement, Fry Stocking, Spawning Channels

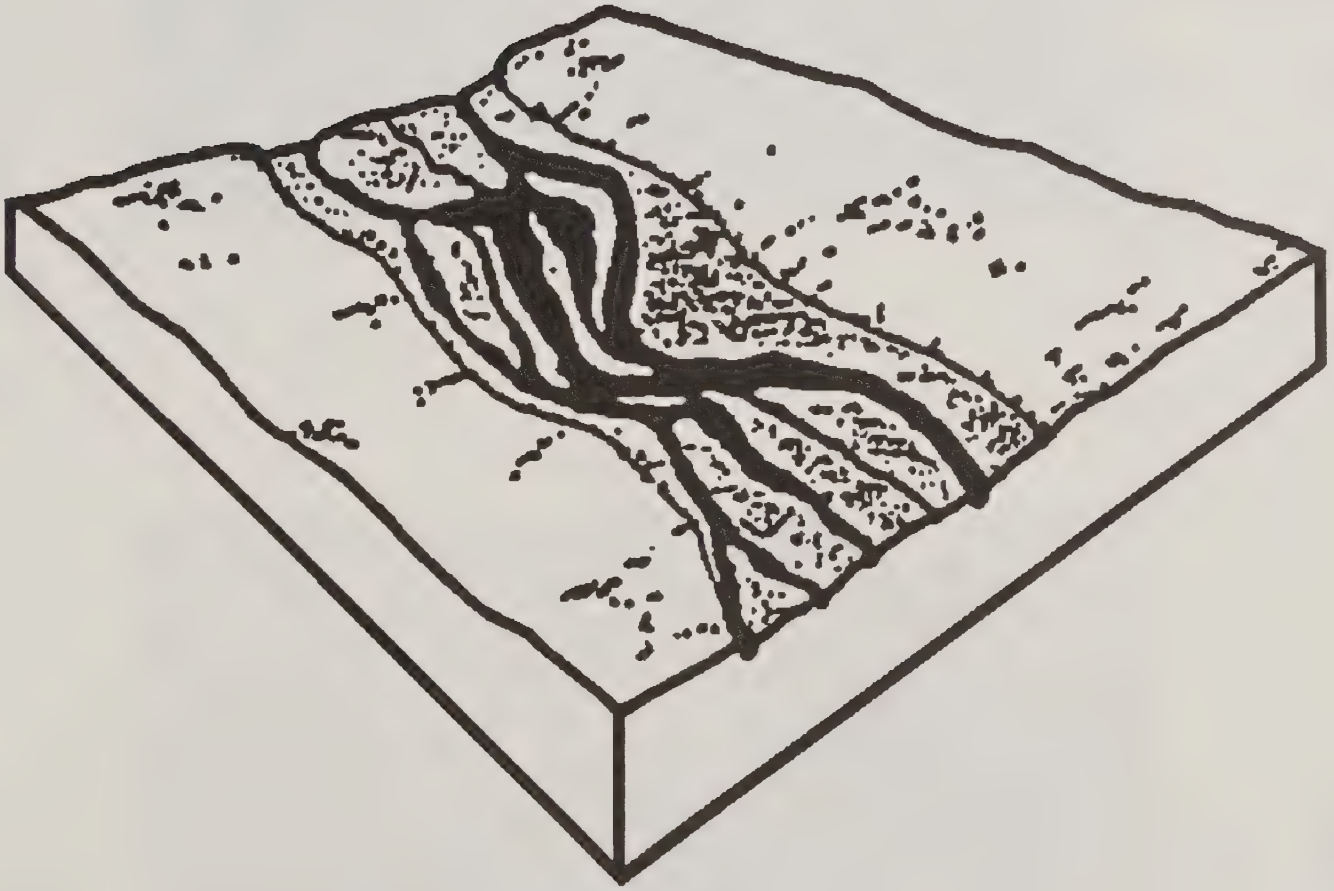
The FP5 channels can offer excellent sport fish opportunities where easy beach access exists. Species of primary interest include Dolly Varden char, steelhead and cutthroat trout, and coho, pink, and chinook salmon. Small boat access into these channels can be good depending on the amount and distribution of large debris jams. Angling is best in deep meander pools and along undercut banks.

A variety of fish habitat enhancement opportunities exists in FP5 channels. Large wood may be limiting along FP5 reaches. Addition of large wood along channel margins can be successful if the structures are well anchored to the stream bank. Fry stocking programs can be implemented to take advantage of under utilized rearing habitat. Spawning channel construction is a potential enhancement option where adequate groundwater upwelling is present.

LANDSCAPE PHOTO: FP5

GLACIAL OUTWASH PROCESS GROUP

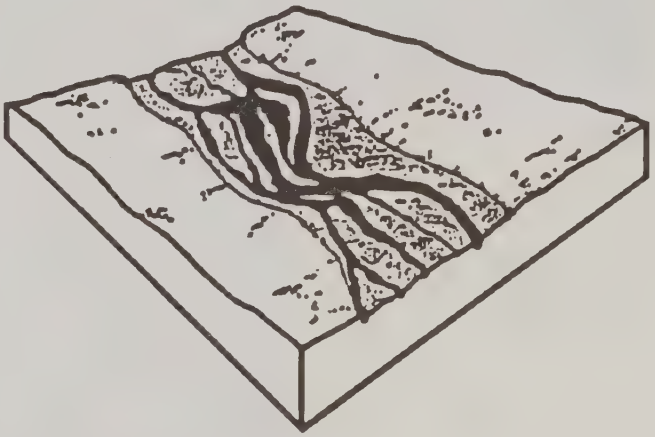
This process group includes GO1 (glacial side channel), GO2 (large meandering), GO3 (large braided), GO4 (moderate width), and GO5 (cirque channel) glacial outwash channel types. These are generally valley or lowland streams, with the exception of high elevation, cirque basin channel types (GO5). Mountain glacier meltwater is the source of runoff to these streams. Consequently, these streams carry extremely high sediment loads and turbid water. Glacial outwash channel types are alluvial channels with stream gradients usually less than three percent. Riparian areas are wide and may extend for more than a thousand meters in large braided outwash plain river systems.



GLACIAL OUTWASH FLOOD PLAIN SIDE CHANNEL
Channel Mapping Symbol: GO1 (Formerly D8)

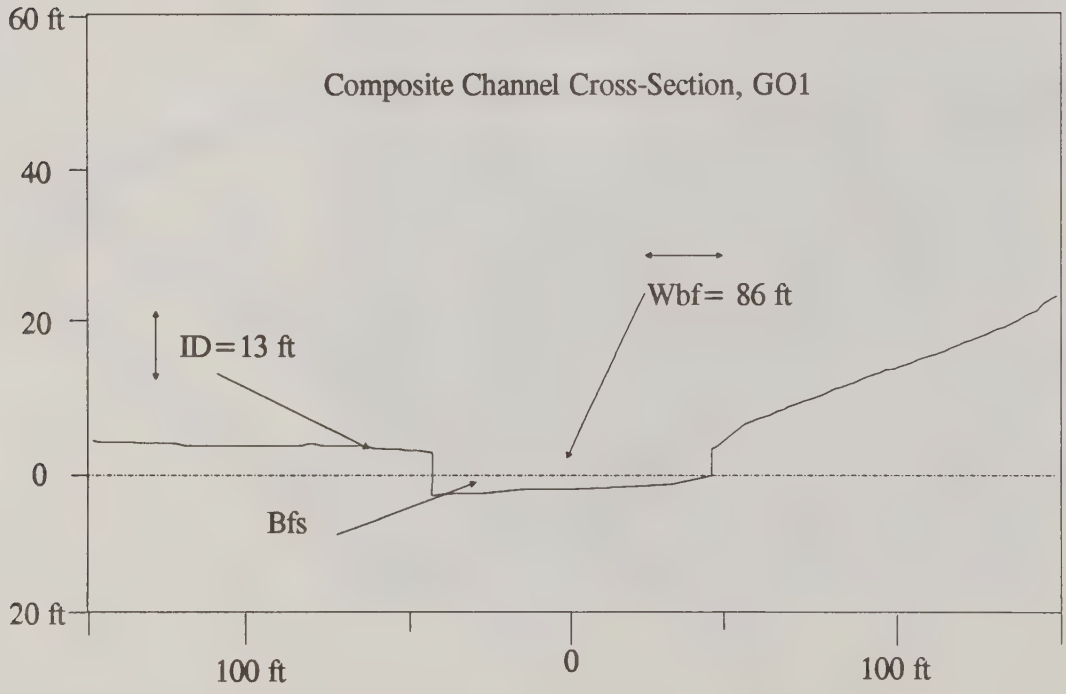
PHYSICAL CHARACTERISTICS

Geographic Setting: The GO1 channel type is usually situated within the broad, glacial valley or foreland landform. The GO1 channel is a side channel that bisects the glacial river terrace and is connected to the main GO2 or GO3 river.



Similar Channel Types: GO2, PA4

Channel Structure



Stream Gradient: .....0-1%, mean = 1%
Incision Depth: .....0-4 m (13 ft)
Bankfull Width:.....10-200 m (33-660 ft), mean = 26 m (86 ft)
Dominant Substrate: .....Sand to coarse gravel
Stream Bank Composition: .....Silt, sand, gravel alluvium
Sideslope Length: .....Not significant, except in glacial moraine deposits
Sideslope Angle: .....Not significant, except in glacial moraine deposits
Channel Pattern:.....Single to multiple channels, sinuous
Drainage Basin Area:.....N/A

INCHANNEL PHOTO: GO1

LANDSCAPE PHOTO: GO1

Riparian Vegetation: The riparian plant community is dominated by nonforested Sitka alder, willow, and cottonwood plant communities. The Sitka spruce series is also a significant riparian vegetation component. The nonforested plant communities occur adjacent to the stream 78 percent of the time.

Plant Association Series	% Cover
Nonforest	73%
Sitka Spruce	20%
Sitka Spruce-Cottonwood	7%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: GO1 channels function as both sediment transport and storage systems. Low gradient, contained channels with high flow volumes have moderate stream energy. Sloughing of the fine textured stream banks can be a common occurrence. GO1 inlets and outlets are normally connected to larger glacial outwash channels (GO3), therefore, stream velocity and stream stage are controlled by the mainstem river.

Aquatic Habitat Capability

Large Woody Debris	Insufficient data
Available Spawning Area (ASA)	Insufficient data
Available Rearing Area (ARA)	Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	MOD	HIGH
Pink	NEG	NEG
Chum	MOD	NEG
Sockeye	MOD	MOD
Chinook	MOD	MOD
Dolly Varden	LOW	LOW
Steelhead	NEG	NEG

These channels are associated with the GO3 large glacial riverine systems and are generally accessible to anadromous fish. ASA decreases and ARA increases as the GO1 channel departs from the mainstem glacial channel. Flow velocities decrease and the number of side channel pools increase (30% of active water with a mean depth of 0.61 meters [1.2 feet] downstream from the GO1 junction with the main channel. Chinook and chum salmon will spawn in moderate densities where stream velocity and substrate are adequate, and in areas where groundwater upwelling occurs. Chinook salmon juveniles will frequently rear in these channels, and rearing coho will occasionally use stream bank habitat with shrub cover. Sockeye salmon will spawn and rear where side channel pools are large or backwater sloughs are nearby. Dolly Varden char will also occasionally spawn and rear in GO1 channels.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....MOD
Sediment Retention .....LOW
Stream Bank Sensitivity.....HIGH
Sideslope Sensitivity.....N/A
Flood Plain Protection.....HIGH
Culvert Fish Passage .....HIGH

Although natural sources of inchannel large woody debris are generally low in GO1 side channels, stable debris accumulations are key habitat features for rearing chinook salmon and, to some extent, coho.

Stream banks are commonly composed of fine (sands and silt), loosely consolidated alluvium. Riparian shrub and forest vegetation is a very important factor for maintaining stream bank stability in GO1 channels. Maintenance of stream bank sensitivity is an important management concern (BMPs 12.7, 13.16).

These streams are usually one component of very extensive glacial flood plain complexes. Adjacent sloughs, small tributaries, beaver ponds, and wetlands are important fish and wildlife habitats. Protection of these flood plain and wetland values is a primary management concern (BMPs 12.4-12.6, 13.8, 13.15, 14.13).

GO1 channel types provide refuge habitat for juvenile salmonids. Therefore, maintenance of unrestricted upstream migration through drainage structures is a key management concern (BMP 14.17).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

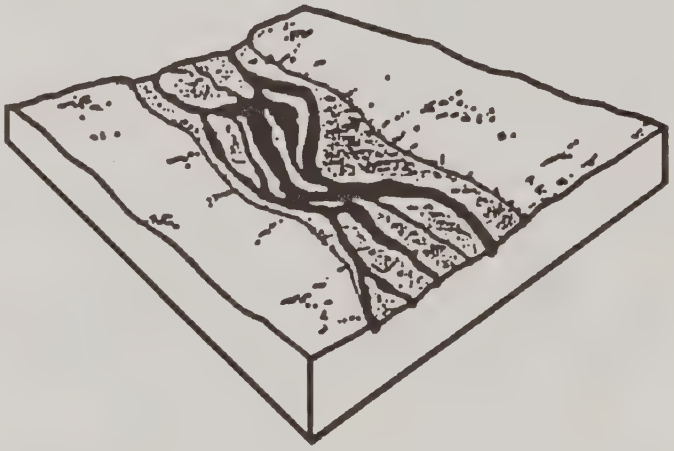
Sport Fish Potential..... LOW
Enhancement Opportunities ..... Beaver Introduction

Encourage and manage beaver colonization to maximize fish rearing capability.

LARGE MEANDERING GLACIAL OUTWASH CHANNEL
Channel Mapping Symbol: GO2 (Formerly D4)

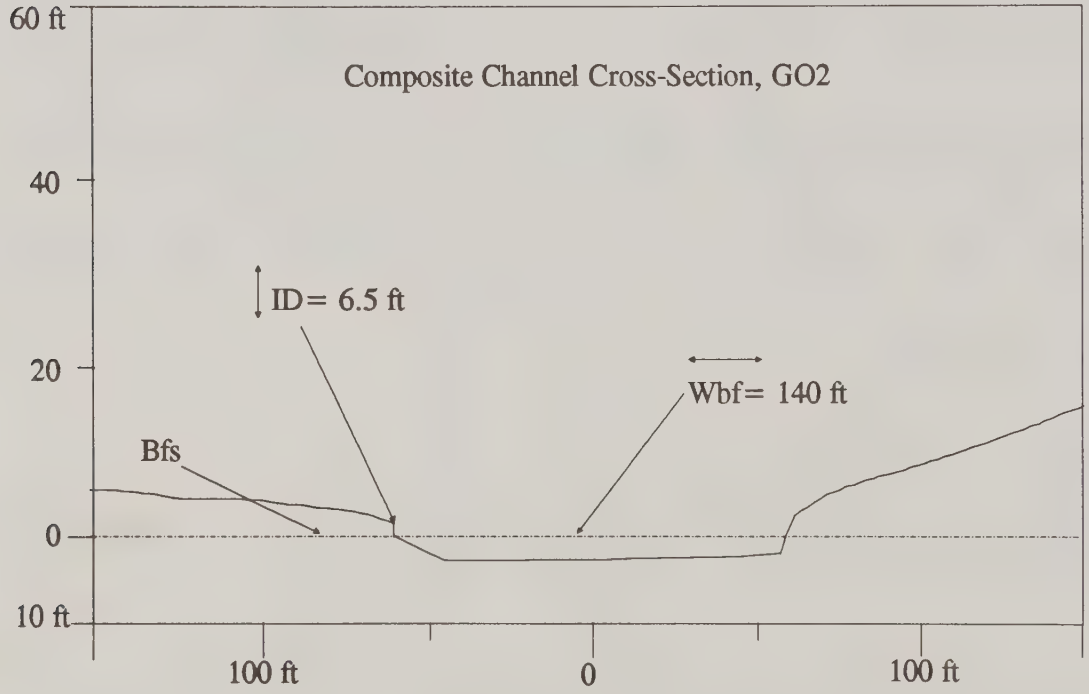
PHYSICAL CHARACTERISTICS

Geographic Setting: The GO2 streams occur in middle to lower valley positions in large drainage basins. Valleys are U-shaped, with large, discontinuous flood terraces adjacent to GO2 streams. Flood plains are the typical adjacent landform in broad valley bottom areas, but inclusions of lowland and hill landforms can occur. These channels are often found at the outlet of glacial lakes.



Similar Channel Types: GO3, GO4

Channel Structure



Stream Gradient: .....<3%, mean = 2%
Incision Depth: .....< or = 4 m (13 ft), mean = 2 m (6.5 ft)
Bankfull Width:.....Variable, mean = 42 m (140 ft)
Dominant Substrate: .....Coarse gravel to small boulder
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant. Exception may be where GO2 channels cut through remnant glacial moraine deposits.
Sideslope Angle: .....Not significant
Channel Pattern:.....Single, sinuous
Drainage Basin Area:.....>51.8 km^2 (20 mi^2)

INCHANNEL PHOTO: GO2

Riparian Vegetation: The riparian plant community is dominated by nonforested Sitka alder, willow, and salmonberry plant communities, which occur adjacent to the stream 64 percent of the time. Mountain hemlock series and Sitka spruce-cottonwood series are the predominant forest communities.

Plant Association Series	% Cover
Nonforest	57%
Mountain Hemlock	11%
Sitka Spruce-Cottonwood	11%
Sitka Spruce	10%
Western Hemlock	8%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: GO2 streams are transport channels that carry high sediment loads. They are more sediment transport oriented than other channel types in the Glacial Outwash Process Group. These are moderate energy streams due to flow containment and a mean gradient of two percent. Large woody debris accumulations are moderately frequent features that help to retain bedload sediment.

Aquatic Habitat Capability

Large Woody Debris .....3500 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	LOW
Pink	NEG	NEG
Chum	MOD	NEG
Sockeye	MOD	LOW
Chinook	MOD	MOD
Dolly Varden	LOW	LOW
Steelhead	NEG	NEG

These channels are usually accessible to anadromous species. Because the substrate consists of larger material (20% gravel, 52% rubble, 18% boulders), ASA is generally low. Spawning chinook and chum salmon use these channels in moderate amounts, as do sockeye salmon when lakes or side sloughs are present in the drainage. Rearing chinook salmon and Dolly Varden char make use of the minimal ARA (3%) consisting of pools (3% of active water) having a mean depth of 0.24 meters (0.8 feet). Because of the shallowness of pools, these channels probably do provide critical overwintering habitat. Coho salmon rear in clear water, off-channel, and side channel areas that flow into GO2 channels.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	MOD
Sediment Retention	LOW
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	LOW
Flood Plain Protection Need	MOD
Culvert Fish Passage	N/A

The influence of large woody debris on channel stability and fish productivity in GO2 channel types is moderate. Stable in-channel debris generally consists of trees anchored to stream banks or large debris jams at meanders. Most of the limited rearing habitat is keyed to this large woody debris. Maintenance of large woody debris is therefore a key riparian management concern (BMP 12.6).

Stream banks in GO2 channels are moderately susceptible to erosion. They are composed of unconsolidated alluvium, therefore, the banks are easily undermined by high velocity currents. These channel stability concerns should be considered when locating and designing stream crossings (BMPs 14.2, 14.3). Bridge abutments can accelerate bank erosion when GO2 channels are constricted (BMP 14.17). Riparian vegetation is integral in maintaining bank stability and the protection of sensitive alluvial soils in GO2 channels (BMP 13.8).

Riparian areas associated with GO2 channel segments are generally less than 61 meters (200 feet) wide. Flood plain side channels and sloughs, though infrequent, are often very important fish rearing areas. Management activities should maintain flood plain values and functions (BMPs 12.6, 13.15, 14.13).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

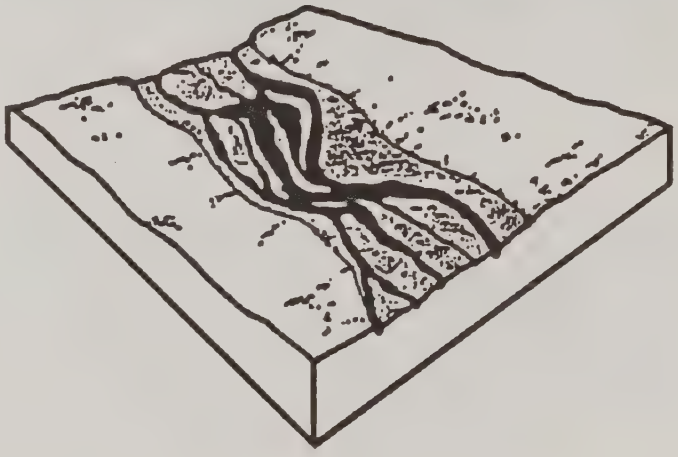
Sport Fish Potential.....LOW
Enhancement Opportunities .....Beaver Introduction

Encourage introduction and management of beaver populations to increase rearing habitat associated with side channels and sloughs.

LARGE BRAIDED GLACIAL OUTWASH CHANNEL
Channel Mapping Symbol: GO3 (Formerly D5)

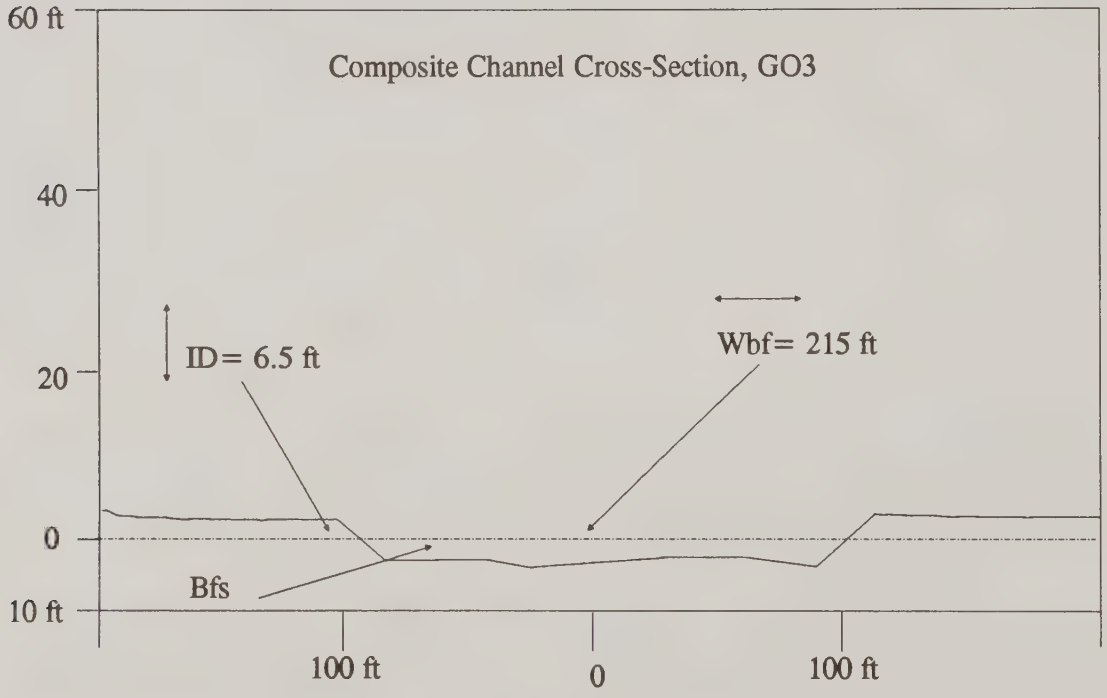
PHYSICAL CHARACTERISTICS

Geographic Setting: GO3 channels occur in very, large, glacial drainage basins. They are located in broad, glacial valley bottoms or on outwash plains. Large flood plains occur adjacent to these channels.



Similar Channel Types: GO4, ES5

Channel Structure



Stream Gradient: .....<3%, mean = 2%
Incision Depth: .....< or = 2 m (6.5 ft)
Bankfull Width:.....60-300 m (200 ft to >1000 ft), mean = 65 m (215 ft)
Dominant Substrate: .....Coarse gravel to large cobble
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant, flat flood plain landform
Sideslope Angle: .....Not significant
Channel Pattern:.....Braided, very wide
Drainage Basin Area:.....>51.8 km^2 (>20 mi^2)

Riparian Vegetation: The riparian plant communities are dominated by nonforested Sitka alder and willow shrub communities and the Sitka spruce-cottonwood/alder plant association. The nonforested communities occur immediately adjacent to the stream 73 percent of the time.

INCHANNEL PHOTO: GO3

Plant Association Series	% Cover
Nonforest	71%
Sitka Spruce-Cottonwood	16%
Sitka Spruce	7%
Mountain Hemlock	6%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: The GO3 channels function as sediment deposition systems. These low gradient, uncontained channels have low stream energy. GO3 channels have extremely large sediment loads, resulting in a braided channel network and extensive flood plain. Peak flow events occur during the summer melt period and during the early fall rainy season.

Aquatic Habitat Capability

Large Woody Debris .....900 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species

MIS	ASA	ARA
Coho	MOD	MOD
Pink	LOW	NEG
Chum	MOD	NEG
Sockeye	MOD	MOD
Chinook	MOD	MOD
Dolly Varden	LOW	LOW
Steelhead	NEG	NEG

GO3 channels are usually accessible to anadromous species. Typically, they provide migration routes to salmon spawning areas in clear water tributaries. Chinook, chum, and sockeye salmon use spawning habitat in portions of the main channel. Spawning capability is limited by fine sediment in gravel spawning beds. Sockeye and chum salmon tend to select gravels where upwelling groundwater is present. Primarily sockeye and chinook utilize rearing areas associated with sloughs, sidechannel pools, and stream bank habitat. Coho and Dolly Varden char rear in low numbers in these channels.

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	MOD
Sediment Retention	LOW
Stream Bank Sensitivity	HIGH
Sideslope Sensitivity	N/A
Flood Plain Protection Need	HIGH
Culvert Fish Passage	N/A

Large wood accumulations have moderate influence on instream habitat in GO3 channel types. Most stable wood accumulations are located along channel margins, sloughs, or side channels. Pool and bank cover associated with large woody debris is particularly important for rearing chinook and sockeye salmon.

Stream banks are naturally susceptible to erosion. Flood flows are poorly contained. Channel aggradation and scour processes are very active due to the extremely large sediment loads. Riparian management should emphasize stream bank protection (BMPs 13.16, 14.13, 14.17). Main stem stream crossings are generally not feasible.

Flood plain protection is a primary management concern for GO3 riparian areas (BMPs 12.6, 13.8, 13.15). Side channels, sloughs and adjacent wetland are typically very extensive. The numerous tributary streams and beaver ponds on GO3 outwash plains are extremely important for fish rearing and spawning. Riparian vegetation is an important factor mitigating potentially destructive flood flows.

Roads constructed across flood plain tributaries must allow unrestricted fish migration from main stem channels (BMP 14.17).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential.....LOW
Enhancement Opportunities .....Spawning Channels and Large Wood Placement

Sport fishing is limited due to poor accessibility and turbid waters.

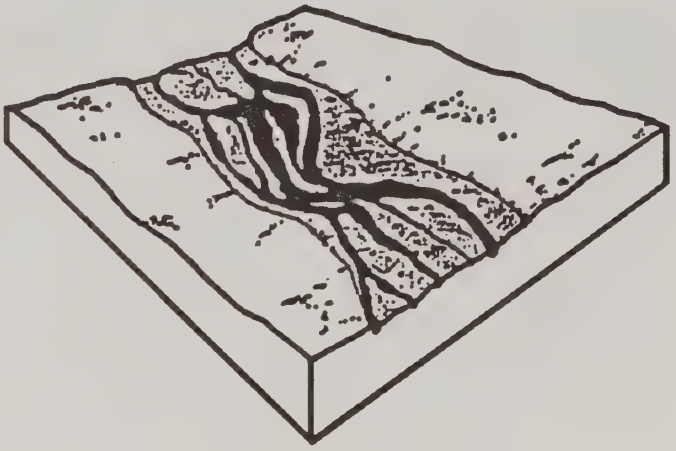
Spawning channel sites can often be located adjacent to GO3 channels. Sources of spawning gravel and shallow ground water are common. Provisions for protecting spawning channel installations from major flooding events should be incorporated into project plans.

Large wood structures can be utilized to improve limited inchannel rearing habitat. However, local sources of suitable large wood pieces are often lacking.

MODERATE WIDTH GLACIAL CHANNEL
Channel Mapping Symbol: GO4 (Formerly D3)

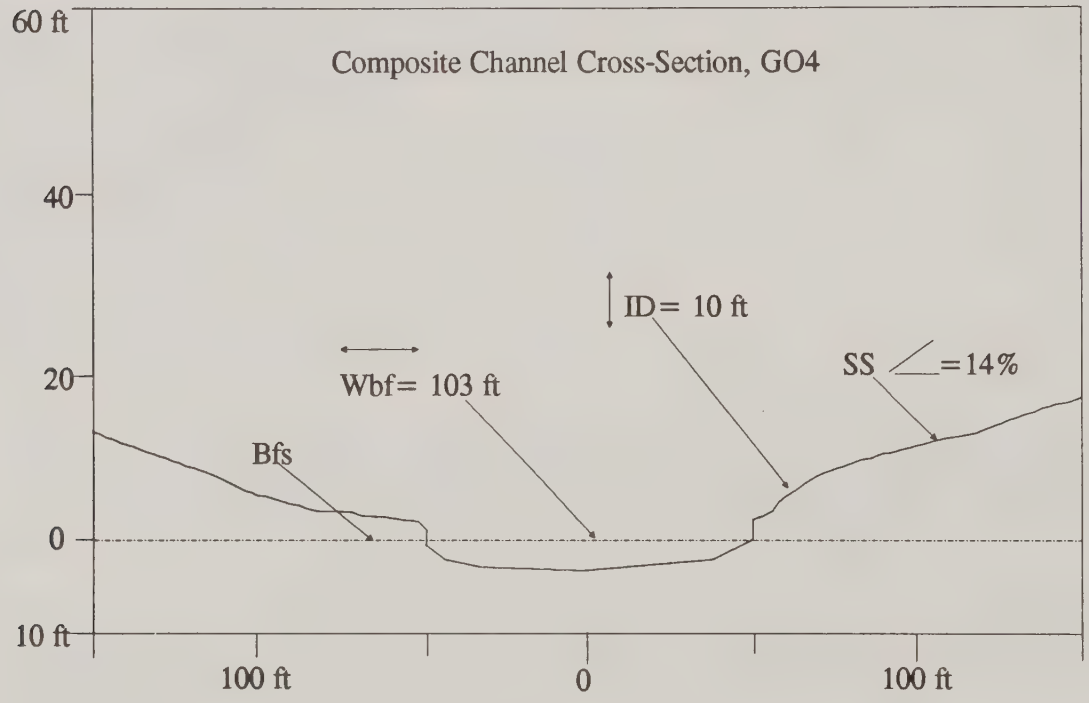
PHYSICAL CHARACTERISTICS

Geographic Setting: The GO4 channel type occurs in the mid to upper valley position in glacial watersheds. Adjacent flood terrace areas are primarily composed of glacial outwash or till. Large valley glaciers and snowfields occur upstream of the GO4 channel type. Snow avalanche cones and subalpine mountainslopes typically occur adjacent to GO4 channels.



Similar Channel Types: GO2, GO5

Channel Structure



Stream Gradient: .....2-6%, mean = 4%
Incision Depth: .....< or = 4 m (13 ft), mean = 3 m (10 ft)
Bankfull Width:.....Variable, mean = 31 m (103 ft)
Dominant Substrate: .....Coarse gravel to small boulder
Stream Bank Composition: .....Alluvium or mixed
Sideslope Length: .....Variable length
Sideslope Angle: .....Mean = 14% (8 degrees)
Channel Pattern:.....Single or multiple
Drainage Basin Area:.....13-52 km^2 (5-20 mi^2)

INCHANNEL PHOTO: GO4

Riparian Vegetation: The riparian plant community is dominated by nonforested alder and willow shrub plant communities.

Plant Association Series	% Cover
Nonforest	77%
Sitka Spruce	7%
Mountain Hemlock	6%
Mixed Conifer	5%
Sitka Spruce-Cottonwood	5%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: GO4 channels are moderate energy streams that transport large sediment loads. Moderate gradient and large size substrate material are indicative of moderate stream power. Some inchannel retention of fine gravels and sand may occur. Bedload transport is predominantly coarse gravel and cobble particle fractions. Peak flows occur in the spring/summer melt period and in the early fall. A high suspended glacial silt load is also characteristic of GO4 channels.

Aquatic Habitat Capability

Large Woody Debris ..... < 500 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 5% for 12 sites
Available Rearing Area (ARA).....Avg = 5% for 12 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	LOW
Pink	NEG	NEG
Chum	LOW	NEG
Sockeye	LOW	NEG
Chinook	LOW	LOW
Dolly Varden	MOD	MOD
Steelhead	NEG	NEG

Downstream barriers frequently make GO4 channels inaccessible to anadromous species. Typically, they get little use from spawning salmon. Rearing coho and chinook juveniles also infrequently use the available rearing area. Dolly Varden char may spawn in the rubble (39%) and gravel (19%) substrate, and rear in side channel pools, and the occasional pool associated with large woody debris. These channels provide little overwintering habitat.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....LOW
Sediment Retention .....MOD
Stream Bank Sensitivity .....MOD
Sideslope Sensitivity .....LOW
Flood Plain Protection Need .....MOD
Culvert Fish Passage.....LOW

Retention of fine gravel and sand is moderate to low. Moderate gradients contribute to good flushing of fine bedload sediments.

Stream bank sensitivity is moderate for GO4 channel segments. Bank composition is dominantly poorly sorted alluvium that is readily eroded by high velocity flows. High sediment loads in GO4 channels result in naturally high rates of channel aggradation and scouring.

Flood plain riparian vegetation contributes greatly to channel stability and reduces channel erosion during flood events. Riparian management should emphasize protection of sensitive channels (BMPs 13.16, 14.17) and alluvial soils (BMPs 12.6, 13.8).

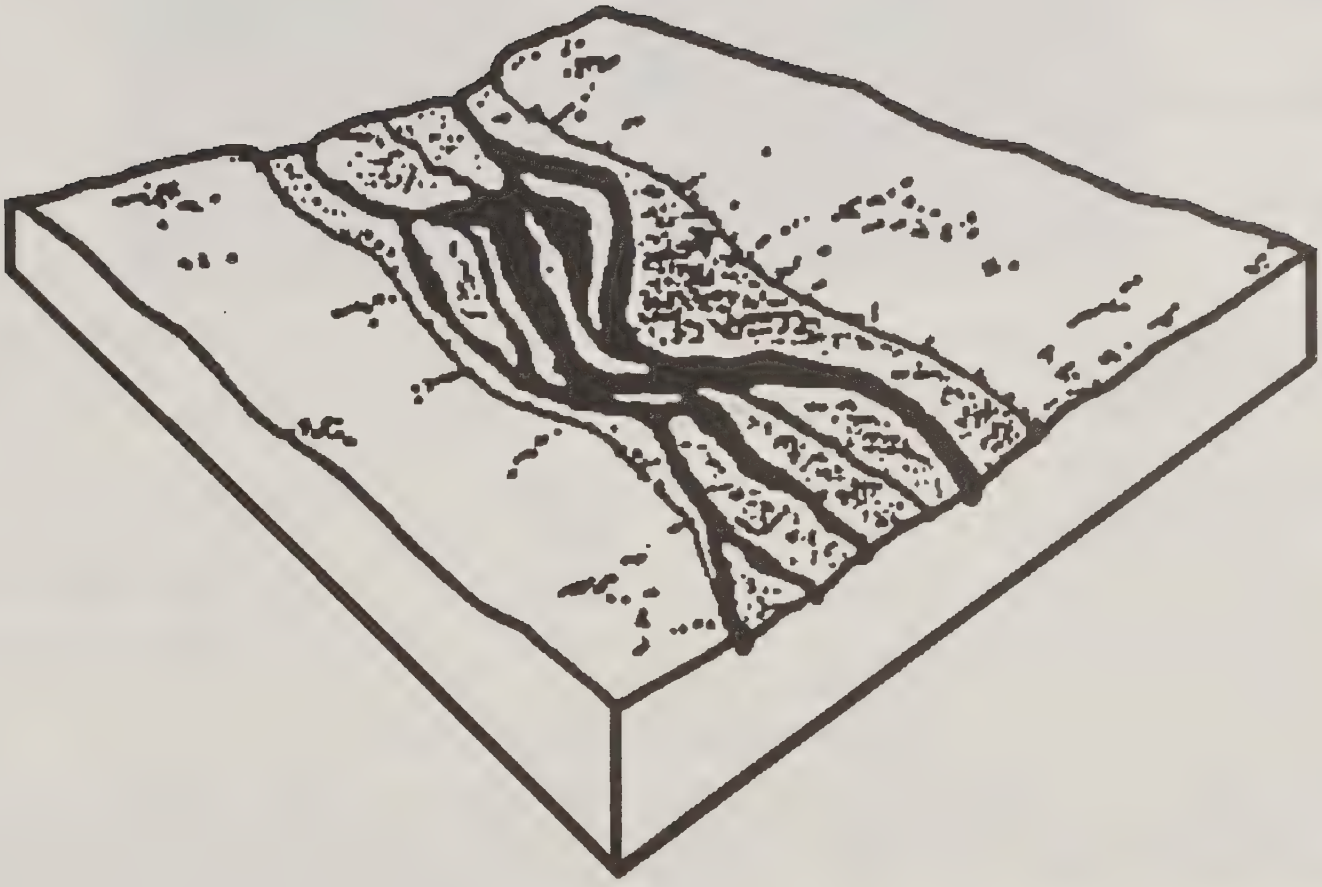
These are classified as Value Class I or II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential.....LOW
Enhancement Opportunities .....Large Wood Placement and Spawning Channels

There may be limited opportunities for developing spawning channels adjacent to GO4 channels. In addition, if sources of large wood are available, large wood structures can be used to improve limited rearing habitat.

Glacial Outwash Process Group



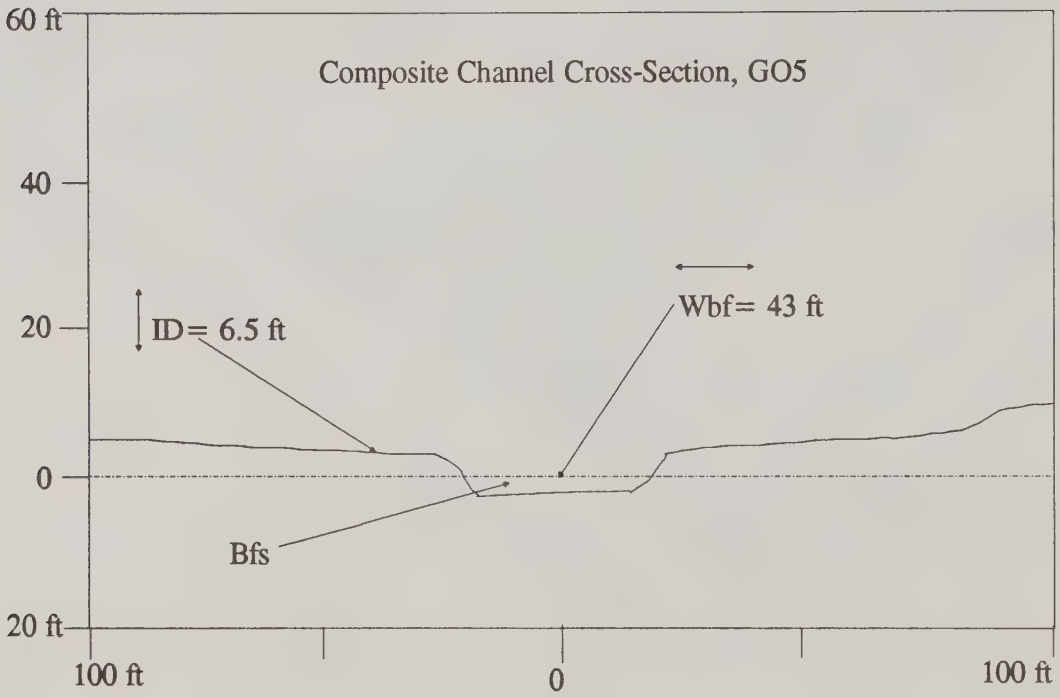
CIRQUE CHANNEL
Channel Mapping Symbol: GO5 (Formerly D1)

PHYSICAL CHARACTERISTICS

Geographic Setting: GO5 streams occur in alpine cirque basins or hanging valley floors. Runoff is derived from the meltwater discharge of a mountain glacier or perennial snow fields. Adjacent valley sideslopes are usually steep and avalanche prone.

Similar Channel Types: AF8, GO4

Channel Structure



Stream Gradient: .....<6%, mean = 3%
Incision Depth: .....< or = 2 m (6.5 ft)
Bankfull Width:.....Variable, mean = 13 m (43 ft)
Dominant Substrate: .....Broad range of substrate material, from bedrock to silt
Stream Bank Composition: .....Alluvium or colluvium
Sideslope Length: .....Not significant
Sideslope Angle: .....Not significant
Channel Pattern:.....Single to braided, normally single at the higher gradient upper end and braided at the lower gradient downstream end.
Drainage Basin Area:.....< 13 km^2 (<5 mi^2)

INCHANNEL PHOTO: GO5

Riparian Vegetation: The riparian plant community is dominated by nonforested alpine meadow, Sitka alder, and willow plant communities, with mountain hemlock/cassiope as the dominant forest plant association. The nonforested plant associations occur along the stream 83 percent of the time.

Plant Association Series	% Cover
Nonforest	86%
Mountain Hemlock	12%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: GO5 channels have moderate stream energy and relatively large sediment loads. Some deposition of gravel and sand occurs at the low gradient terminus of the channel. Large clast substrate may result from mass wasting processes on adjacent steep mountainslopes. Poorly contained channel segments typically have a braided channel pattern.

Aquatic Habitat Capability

Large Woody Debris .....N/A
Available Spawning Area (ASA).....N/A
Available Rearing Area (ARA).....N/A

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	NEG	NEG
Steelhead	NEG	NEG

These channels are generally inaccessible to anadromous and resident species due to downstream barriers. Fish use is insignificant.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....N/A
Sediment Retention .....MOD
Stream Bank Sensitivity .....MOD
Sideslope Sensitivity .....LOW
Flood Plain Protection.....LOW
Culvert Fish Passage.....N/A

These streams temporarily retain sediment delivered from snow avalanche and mountain glacier runoff.

Stream banks are composed of unconsolidated colluvial and alluvial sediments. Lateral channel migration and stream braiding is common in GO5 channel types. Stream channel disturbances can accelerate natural stream bank instability (BMPs 12.7, 14.13, 14.17).

These are classified as Value Class III streams.

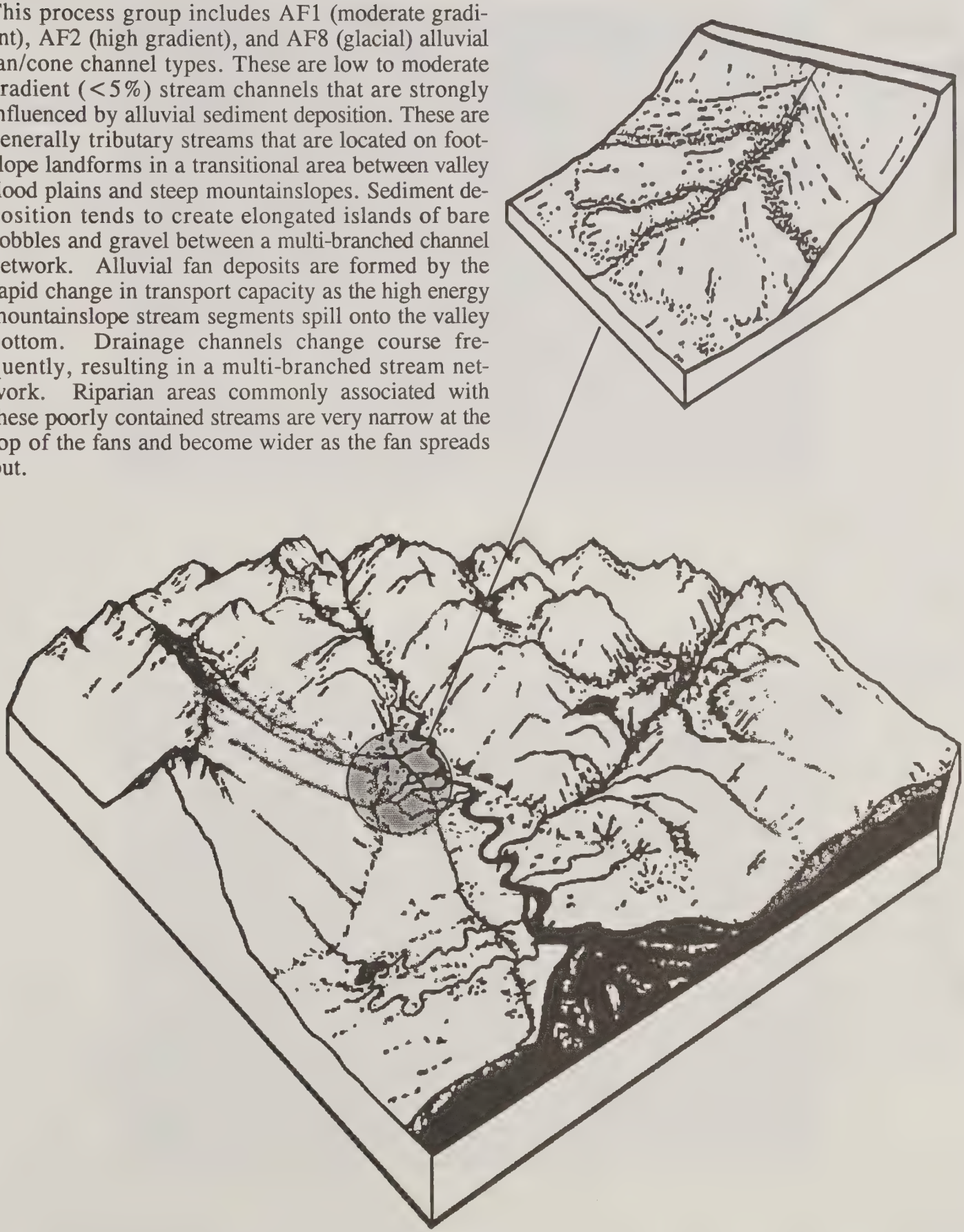
Riparian Management Opportunities:

Sport Fish Potential.....LOW
Enhancement Opportunities .....Resident Fisheries

When these channels feed from deep cirque lakes, there may be potential to create resident cutthroat and grayling spawning habitat.

ALLUVIAL FAN PROCESS GROUP

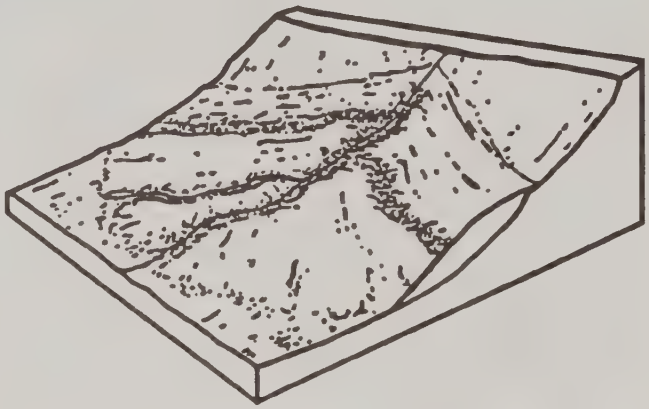
This process group includes AF1 (moderate gradient), AF2 (high gradient), and AF8 (glacial) alluvial fan/cone channel types. These are low to moderate gradient (<5%) stream channels that are strongly influenced by alluvial sediment deposition. These are generally tributary streams that are located on footslope landforms in a transitional area between valley flood plains and steep mountainslopes. Sediment deposition tends to create elongated islands of bare cobbles and gravel between a multi-branched channel network. Alluvial fan deposits are formed by the rapid change in transport capacity as the high energy mountainslope stream segments spill onto the valley bottom. Drainage channels change course frequently, resulting in a multi-branched stream network. Riparian areas commonly associated with these poorly contained streams are very narrow at the top of the fans and become wider as the fan spreads out.



MODERATE GRADIENT ALLUVIAL FAN CHANNEL
Channel Mapping Symbol: AF1 (Formerly B5)

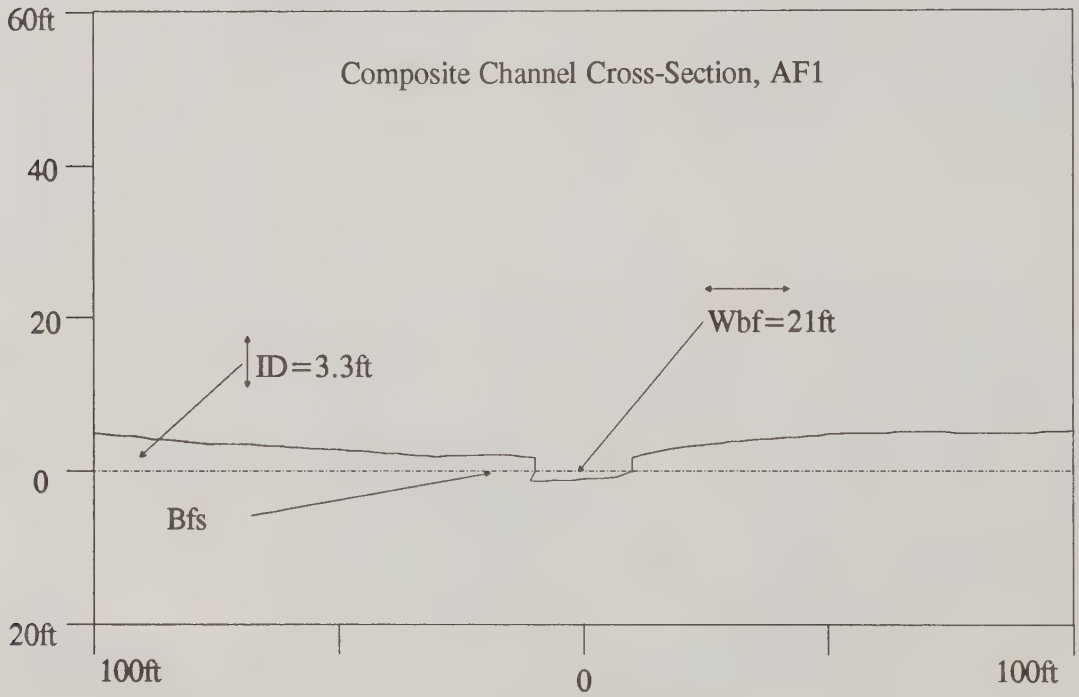
PHYSICAL CHARACTERISTICS

Geographic Setting: The AF1 channel type is exclusively associated with the alluvial fan landform. Normally, this landform is positioned between steep mountainslopes or hillslopes and flat valley bottoms or lowlands. In many valleys, AF1 streams lie adjacent to and merge with low gradient flood plain streams



Similar Channel Types: AF2, FP3, MM1, HC2

Channel Structure



Stream Gradient: .....1-6%, mean = 4%
Incision Depth: .....< 2 m (6.5 ft), mean = 1 m (3.3 ft)
Bankfull Width:.....< 20 m (66 ft), mean = 6 m (21 ft)
Dominant Substrate: .....Fine gravel to large cobble
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant, concave landform associated
Sideslope Angle: .....Not significant
Channel Pattern:.....Single to multiple, channels spread across alluvial fan deposits
Drainage Basin Area:.....< 5.2 km^2 (< 2 mi^2)

INCHANNEL PHOTO: AF1

LANDSCAPE PHOTO: AF1 (foreground)

Riparian Vegetation: The dominant riparian plant community is the Sitka spruce series, with Sitka spruce/blueberry and Sitka spruce/blueberry-devil's club being the most common plant associations. Salmonberry and red alder shrubs dominate the nonforest riparian plant communities.

Plant Association Series	% Cover
Sitka Spruce	68%
Western Hemlock	15%
Nonforest	8%
Western Hemlock-Red Cedar	6%
Mixed Conifer	2%

Channel Type Phases:

☐ AF2s - SHRUB PHASE consists primarily of brush riparian vegetation.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: AF1 channels are transitional streams from high gradient mountainslope to low gradient, valley bottom streams. This complex stream network exhibits a wide range of sediment erosion, transport, and deposition processes. Bank erosion, outwash sediment deposition, and lateral channels are common dynamic processes. Sediment transport occurs in the high and moderate gradient reaches of alluvial fan channels, leaving a substrate composed of larger cobble size materials. Extensive, fine gravel deposits are common on the lower reaches of the AF1 streams adjacent to the valley bottom flood plain channels.

Aquatic Habitat Capability

Large Woody Debris .....12,000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 7% for 14 sites
Available Rearing Area (ARA).....Avg = 15% for 14 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	MOD	MOD
Pink	MOD	NEG
Chum	MOD	NEG
Sockeye	MOD	NEG
Chinook	NEG	NEG
Dolly Varden	MOD	MOD
Steelhead	LOW	LOW

AF1 channels are frequently accessible to anadromous species. The available rearing habitat is good, especially where they join mainstem channels in the lower reaches of a watershed. Coho and Dolly Varden use the pools (17% of active water, mean depth of 0.27 meters [0.9 feet]) commonly associated with large woody debris accumulations. Overwintering habitat is provided in these pools and along low gradient channel segments near the base of the alluvial fan where upwelling groundwater moderates water temperature and inhibits ice formation. Spawning areas located in the lower gradient, downstream portions of AF1 channels are moderately used by most species of anadromous salmon and Dolly Varden. When located next to accessible lakes, these channels provide good spawning habitat for sockeye salmon.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris..... HIGH
Sediment Retention..... HIGH
Stream Bank Sensitivity ..... HIGH
Sideslope Sensitivity ..... N/A
Flood Plain Protection Need..... HIGH
Culvert Fish Passage..... HIGH

Large woody debris accumulations play a significant role in the morphology and function of AF1 channels. These stream segments have high large woody debris volumes, due to productive spruce stands that are typically associated with alluvial fan landforms. This large woody debris functions as a trap for bedload sediments and often forms log steps that contribute significantly to the development of pools that provide rearing habitat for fish. Maintenance of large woody debris sources is an important riparian management need (BMP 12.6).

Stream banks are naturally unstable due to fine textured alluvial bank materials. Sediment retention is high in some stream segments. Active bedload deposition and channel aggradation result in the formation of numerous side channels. Two or more main flow channels with extensive braided outwash deposits are common on the more active alluvial fans. Erosion control and stream bank protection should be emphasized for these streams (BMPs 12.7, 13.11-13.13, 13.16).

The flood plain soils consist of shallow organic mats that are very sensitive to physical disturbance (BMP 13.8). Alder and salmonberry quickly colonize the sensitive alluvial soils, making conifer recolonization difficult.

Road crossings should be avoided at low gradient channel segments along the base of alluvial fan drainage systems (BMPs 14.2, 14.13). Culvert crossing in these areas may restrict upstream migration of juvenile salmonids (BMP 14.17). Culverts are also very susceptible to clogging by bedload sediment and woody debris. Control of inchannel operations is also an important riparian management concern for these streams (BMP 14.14). An accelerated maintenance schedule (BMP 14.20) and special measures to stabilize road drainage structures should be incorporated in road crossing structure design and in the development of road management objectives (BMP 14.1). Bridge crossing structures at the fan apex are generally the most suitable stream crossing option for AF1 channels.

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities

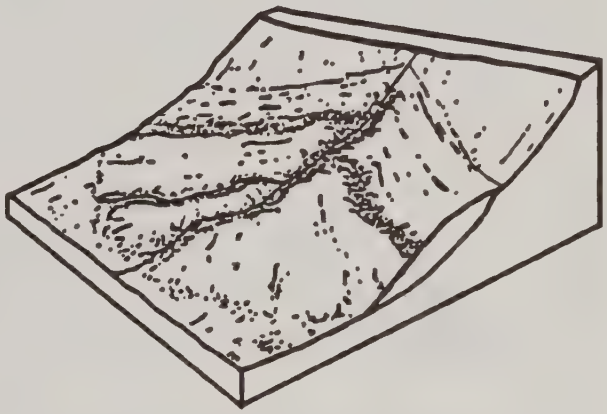
Sport Fish Potential .....LOW
Enhancement Opportunities.....Large Wood Placement

Large wood placement can be used effectively to increase availability of pool rearing habitat in stable AF1 stream reaches, however, given the general instability of these channels, consideration must be employed to avoid destabilization of channels when placing large woody debris structures.

HIGH GRADIENT ALLUVIAL CONE CHANNEL
Channel Mapping Symbol: AF2 (Formerly A3)

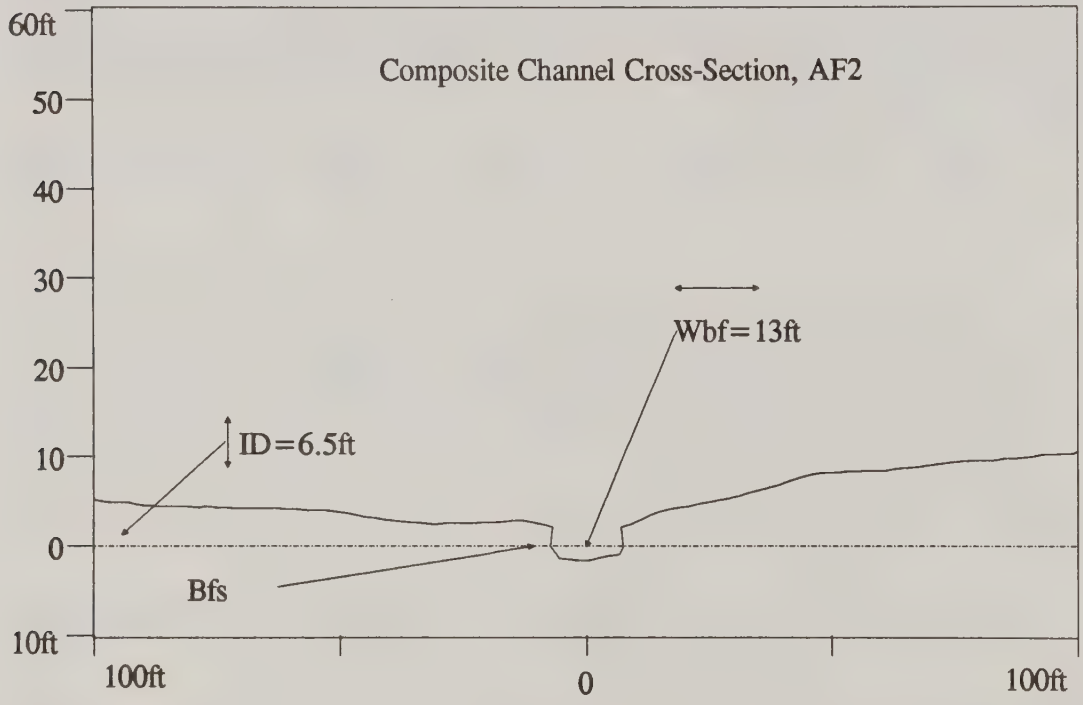
PHYSICAL CHARACTERISTICS

Geographic Setting: AF2 streams are typically situated on alluvial fan/cone landforms in steep sided, V-shaped valleys. These streams are located on transitional areas between mountain sideslopes and valley floors. AF2 channels are frequently located directly downstream from HC5 and HC6 channels. Less frequently, AF2 streams occur on sloping lowlands preceded by an HC3 stream. These channels have shallow incision, with poor flow containment. Channel pattern is single to multibranched.



Similar Channel Types: AF1, HC2

Channel Structure



Stream Gradient: .....>6% (at midpoint of alluvial cone), mean = 11%
Incision Depth: .....< or = 4 m (13 ft), mean = 2 m (6.5 ft)
Bankfull Width:.....Variable, mean = 4 m (13 ft)
Dominant Substrate: .....Coarse gravel to small boulders
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant, alluvial cone landform is concave cross-section
Sideslope Angle: .....Not significant
Channel Pattern:.....Single to multibranched at lower end
Drainage Basin Area:.....5.2 km^2 (<2 mi^2)

Riparian Vegetation: The riparian plant communities are dominantly Sitka spruce series, with western hemlock series and the nonforested communities also common. Red alder, salmonberry, and Sitka alder shrubs dominate the nonforest riparian plant communities.

Plant Association Series	% Cover
Sitka Spruce	43%
Western Hemlock	24%
Nonforest	19%
Mountain Hemlock	4%
Western Hemlock-Alaska Cedar	4%
Mixed Conifer	4%

Channel Type Phases: N/A

LANDSCAPE PHOTO: AF2s

MANAGEMENT CONSIDERATIONS

Hydrologic Function: AF2 channels function in a transitional capacity for the steep, sediment transport oriented channels upstream and the lower gradient, valley bottom channels downstream. These streams flow over and actively rework the deposited material that has formed the alluvial cone landform. AF2 channels act as rapid transport systems for material smaller than small cobbles. Small accumulations of fine sediment may be stored in pools associated with large boulders. Large woody debris plays a critical role in the stability of the banks and channels. Snow avalanche and debris flow processes also affect AF2 stream courses (See AF2s phase.)

Aquatic Habitat Capability

Large Wood Debris ..... 5500 ft^3/1000 linear ft
Available Spawning Area (ASA) ..... Insufficient data
Available Rearing Area (ARA) ..... Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	LOW
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	LOW	NEG
Chinook	NEG	NEG
Dolly Varden	LOW	MOD
Steelhead	NEG	NEG

Due to high stream flow velocities, AF2 channels are only occasionally accessible to anadromous fish species. When accessible, it is at the downstream end, usually adjacent to FP4 and FP5 channels, where the gradient is low enough to allow AF2 habitat to be used. AF2 channels contain low amounts of spawning and rearing habitat. Being located at the sediment/water source areas of watersheds, AF2 channels typically influence downstream fish habitat productivity.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....MOD
Sediment Retention .....MOD
Stream Bank Sensitivity.....HIGH
Sideslope Sensitivity.....N/A
Flood Plain Protection Need .....HIGH
Culvert Fish Passage.....LOW

Large woody debris has moderate influence on many AF2 channel types. Except for segments located below snow avalanche tracts, which contain shrub cover and minor debris loading, the large woody debris is integral in retarding downstream sediment transport.

Sediment retention is moderate, consisting predominantly of coarse, cobble size, bedload sediments.

Protection of sensitive alluvial soils should be emphasized (BMP 13.8).

AF2 stream banks form on alluvium, therefore, they are naturally sensitive (BMPs 12.7, 13.16).

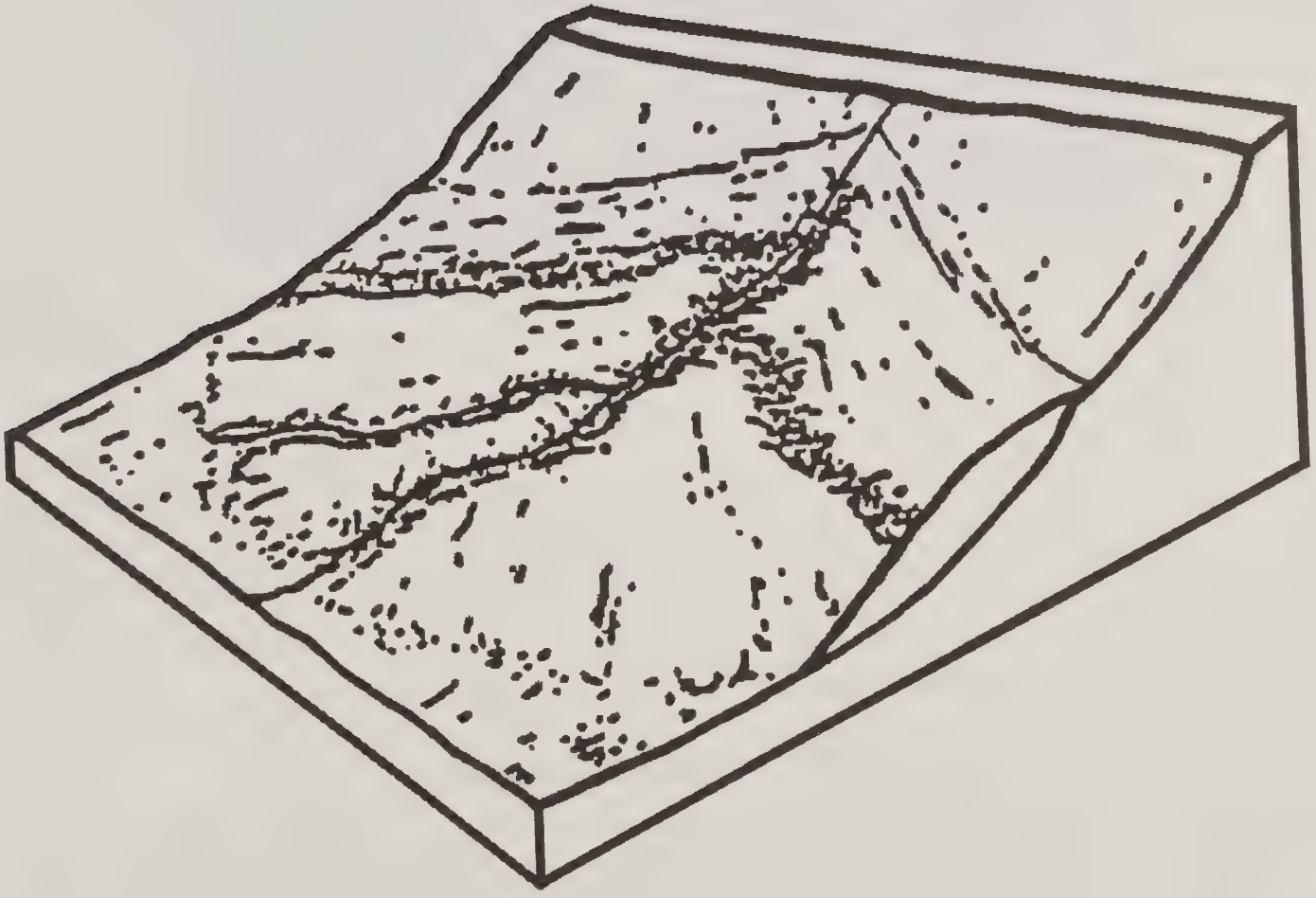
Channel shifts are easily precipitated by log jams, removal of riparian vegetation, debris deposits from upstream mass wasting, and snow avalanche activity. Multiple channels are common below the apex of alluvial cone landforms. Location and design of stream crossing structures are primary riparian management concerns for AF2 streams (BMPs 14.1, 14.2, 14.17). The most stable road crossing sites are generally located near the apex of the alluvial cone landform. Culvert structures have a high risk of being clogged by bedload and woody debris on AF2 channel segments. Road maintenance and measures to stabilize road drainage structures should be emphasized for these streams (BMP 14.20).

These are classified as Value Class II streams. A minimum 100 foot buffer is often required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities

Sport Fish Potential..... LOW
Enhancement Opportunities ..... N/A

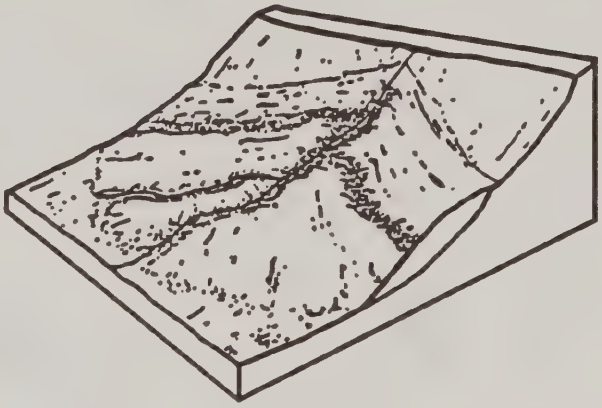
Alluvial Fan Process Group



GLACIAL ALLUVIAL CONE CHANNEL
Channel Mapping Symbol: AF8 (Formerly D6)

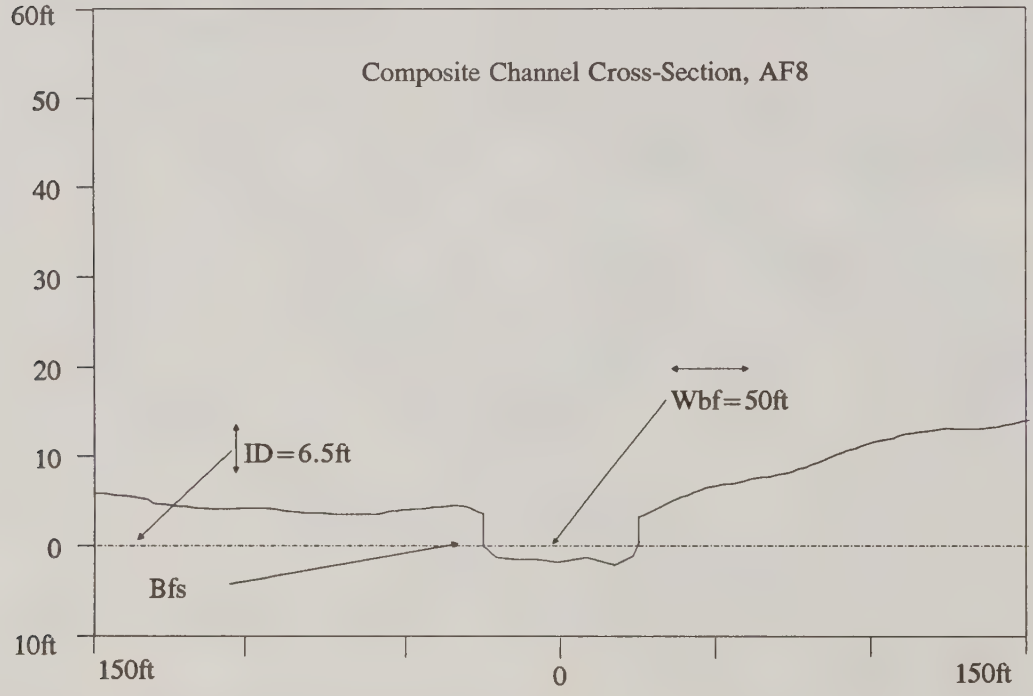
PHYSICAL CHARACTERISTICS

Geographic Setting: The AF8 occurs on alluvial cone landforms in glacial drainage basins. At least 15 percent of the drainage area must be covered by a glacier or permanent snowfield to qualify as a AF8 channel. Channel gradients are commonly greater than six percent. Channel pattern is variable, usually singular at the apex of the cone and branching at the terminus. Suspended glacial silt load is high in these channels.



Similar Channel Types: AF2, GO5

Channel Structure



Stream Gradient: .....Variable, >6%, mean = 17%
Incision Depth: .....< or = 2 m (6.5 ft)
Bankfull Width:.....Variable, mean = 15 m (50 ft)
Dominant Substrate: .....Coarse gravel to small boulder
Stream Bank Composition: .....Alluvium
Sideslope Length: .....Not significant
Sideslope Angle: .....Not significant
Channel Pattern:.....Single to multiple channel, normally single at the apex of the fan with channel branching at the terminus.
Drainage Basin Area:.....2.6-13 km^2 (1-5 mi^2)

INCHANNEL PHOTO: AF8

Riparian Vegetation: The riparian plant community is dominated by nonforested Sitka alder, willow, and salmonberry shrub communities.

Plant Association Series	**% Cover**
Nonforest	91%
Mountain Hemlock	3%
Sitka Spruce	3%
Western Hemlock	3%

Channel Type Phases:

☐ AF8s - SHRUB PHASE consists primarily of brush riparian vegetation.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: AF8 channels have high rates of sediment transport and deposition. Sediment is delivered to these cone or fan channels from alpine glacier runoff, mountainslope avalanche, and mass wasting processes. Sediment outwash lobes are deposited across the surface of the alluvial cone by a network of multiple branched channels. Consequently, these are very dynamic landforms.

Aquatic Habitat Capability

Large Woody Debris	N/A
Available Spawning Area (ASA)	Insufficient data
Available Rearing Area (ARA)	Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	LOW	NEG
Sockeye	LOW	NEG
Chinook	NEG	NEG
Dolly Varden	LOW	LOW
Steelhead	NEG	NEG

AF8 channels are often accessible to anadromous fish, and are occasionally accessible to resident fish. The amount of ASA and ARA are insignificant. Substrate material is generally large, consisting of 22% gravel, 43% rubble, and 31% boulders and bedrock. Chum salmon and Dolly Varden char may spawn where finer substrate is found at the base of these alluvial cones near the junction with mainstem river channels. Shallow groundwater aquifers associated with alluvial cones can significantly improve spawning habitat in adjacent mainstem streams where groundwater upwelling occurs. Where these channels feed accessible lakes, spawning by sockeye salmon and resident species may occur.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	LOW
Sediment Retention	LOW
Stream Bank Sensitivity	HIGH
Sideslope Sensitivity	N/A
Flood Plain Protection Need	HIGH
Culvert Fish Passage	N/A

Stream banks are naturally unstable in AF8 channels, and riparian vegetation plays an important role in stabilizing these banks, therefore, maintaining riparian vegetation integrity is an important management concern (BMPs 12.6, 13.16). Large sediment loads from glacial meltwater and snow avalanches cause extensive channel aggradation and frequent channel shifting. Consequently, bridge and culvert design, and road maintenance are key riparian management concerns (BMPs 14.17, 14.20).

These are classified as Value Class II or III streams. A minimum 100 foot timber harvest buffer is occasionally required along both banks of these streams (Tongass Timber Reform Act, 1991).

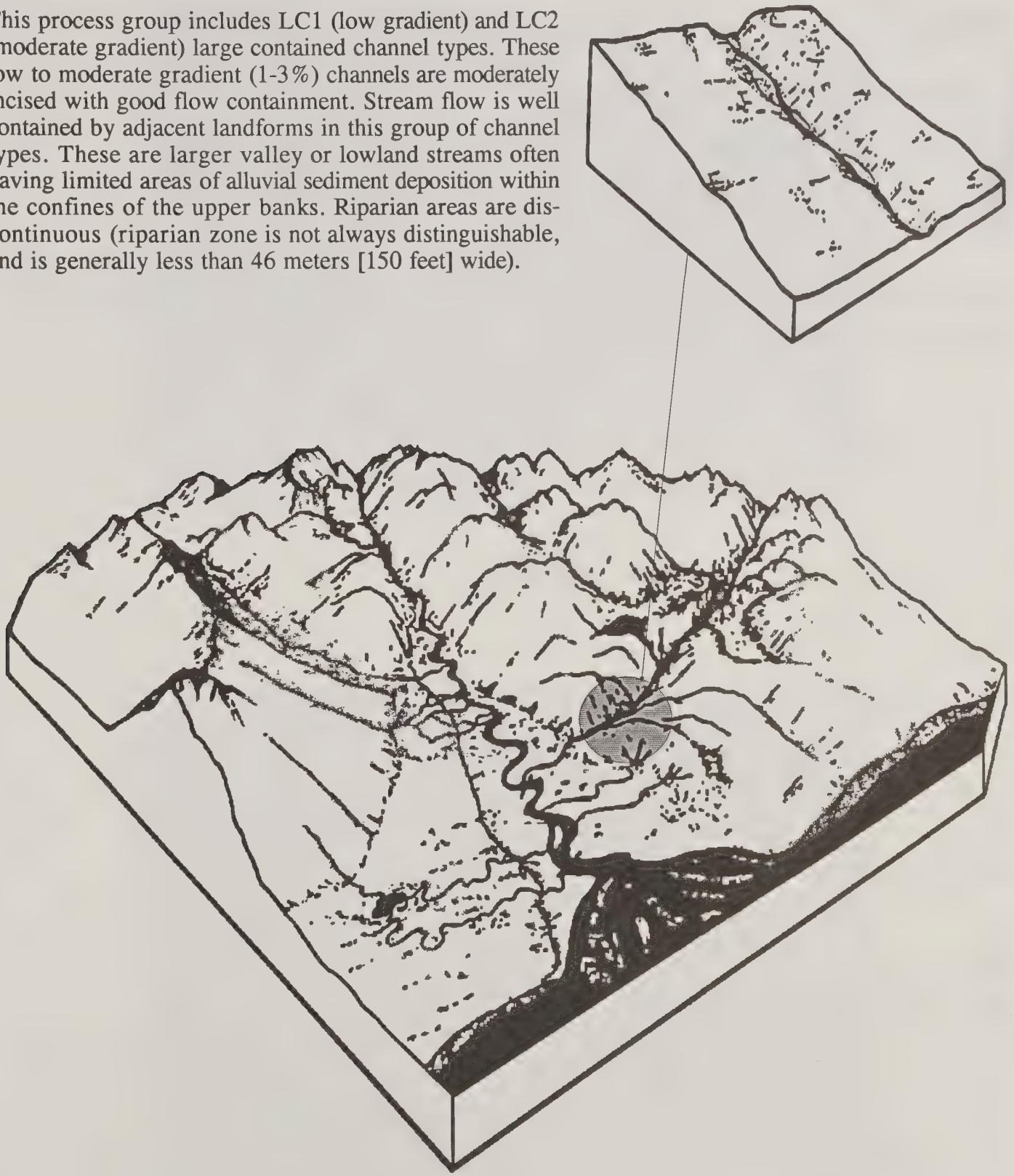
Riparian Management Opportunities

Sport Fish Potential	N/A
Enhancement Opportunities	Spawning Channels

Spawning channel sites can often be located in the vicinity of glacial alluvial cone channels where suitable gravel substrate and shallow groundwater aquifers often occur. Provisions for protecting spawning gravel installations from flooding and sediment deposition should be incorporated into project plans.

LARGE CONTAINED PROCESS GROUP

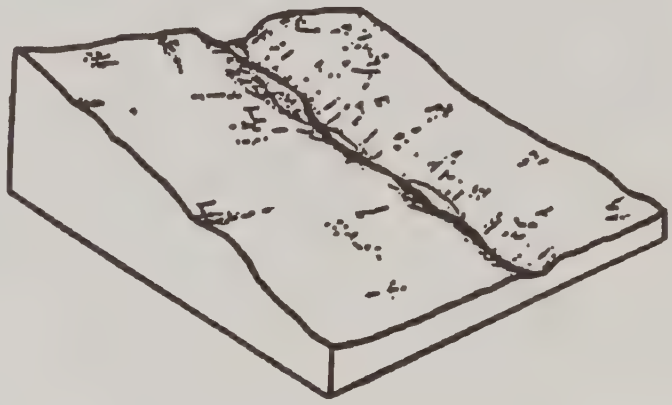
This process group includes LC1 (low gradient) and LC2 (moderate gradient) large contained channel types. These low to moderate gradient (1-3%) channels are moderately incised with good flow containment. Stream flow is well contained by adjacent landforms in this group of channel types. These are larger valley or lowland streams often having limited areas of alluvial sediment deposition within the confines of the upper banks. Riparian areas are discontinuous (riparian zone is not always distinguishable, and is generally less than 46 meters [150 feet] wide).



LOW GRADIENT CONTAINED CHANNEL
Channel Mapping Symbol: LC1 (Formerly C2)

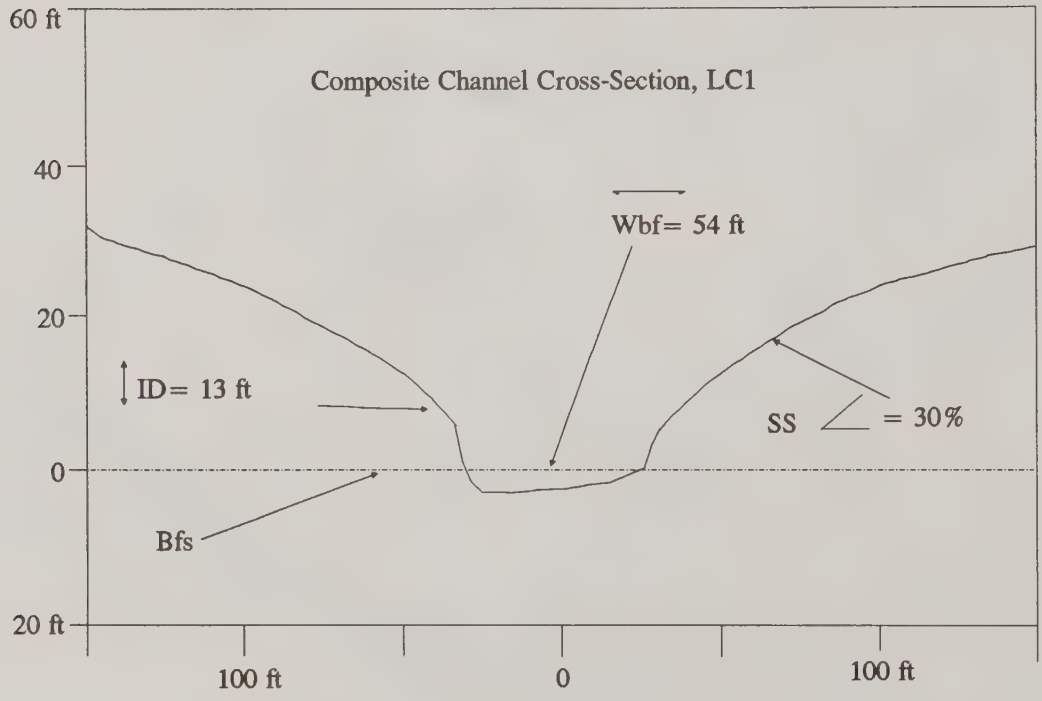
PHYSICAL CHARACTERISTICS

Geographic Setting: LC1 channels are normally situated in broad valley bottoms largely composed of lowlands landforms. Hills and mountainslopes may abut one bank of the LC1 channel type. Lateral channel migration is generally controlled by frequent bedrock outcrops along stream banks.



Similar Channel Types: MC1, MC2, LC2

Channel Structure



Channel Gradient:.....<2%, mean = 1%
Incision Depth: .....<10 m (33 ft), mean = 4 m (13 ft)
Bankfull Width:.....>10 m (33 ft), mean = 16 m (54 ft)
Dominant Substrate: .....Coarse gravel to bedrock
Stream Bank Composition: .....Bedrock or mixed
Sideslope Length: .....<20 m (66 ft), mean = 10 m (33 ft)
Sideslope Angle: .....Mean = 30% (20 degrees)
Channel Pattern:.....Single, linear channel, rectangular pattern
Drainage Basin Area:.....13-52 km^2 (5-20 mi^2)

INCHANNEL PHOTO: LC1

LANDSCAPE PHOTO: LC1

Riparian Vegetation: The riparian plant communities are dominantly western hemlock series, with the Sitka spruce series and the mixed conifer series also being significant. The LC1g phase is dominated by the Sitka spruce and western hemlock-red cedar series. Nonforest riparian plant communities are dominated by red alder, willow, and salmonberry shrub communities.

Plant Association Series	% Cover	
	LC1	LC1g
Western Hemlock	43%	15%
Mixed Conifer	15%	23%
Sitka Spruce	12%	19%
Western Hemlock-Red Cedar	12%	31%
Shore Pine	9%	---
Western Hemlock-Alaska Cedar	2%	---
Nonforest	4%	5%
Mountain Hemlock	---	6%

Channel Type Phases:

- ☐ LC1g - GLIDE PHASE has consistently lower gradient stream reaches than is typical for LC1 channels. This phase tends to occur where channel base level is controlled by a downstream feature such as resistant bedrock outcrops or a lake inlet or outlet.
- ☐ LC1r - MORAINE PHASE has bank control from glacial moraine deposits. Stream substrate has a larger boulder component, and sideslope stability may be lower than is typical for LC1 channels.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: LC1 channels store and transport sediment. Stream substrate is predominantly bedrock and larger boulder and cobble material, intermingled with pockets of gravel or cobble sized material. Silt, sand and fine gravels are typically flushed through LC1 channels. During high flow events, which are well contained by the stable upper banks, fines to cobble size materials are mobilized and transported downstream. Large woody debris volumes are relatively low in these channels. Where large woody debris accumulations do occur, significant amounts of coarse to fine gravels and sand can be retained.

Aquatic Habitat Capability

Large Woody Debris .....2000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 6% for 25 sites
Available Rearing Area (ARA).....Avg = 18% for 25 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	MOD	MOD
Pink	MOD	NEG
Chum	MOD	NEG
Sockeye	LOW	NEG
Chinook	NEG	NEG
Dolly Varden	HIGH	HIGH
Steelhead	MOD	HIGH

LC1 channels are frequently accessible to anadromous species, however, partial or complete barriers can occur at bedrock knickpoints. These channels are frequently used by spawning pink, chum, and steelhead species, and occasionally by coho. Spawning areas are limited due to the predominately large substrates. LC1 channels may have limited rearing potential, except in areas of large woody debris accumulations. Steelhead and resident Dolly Varden frequently use boulder-pool habitat in these channels for rearing. LC1 channels provide extensive overwintering habitat for steelhead trout.

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	LOW
Sediment Retention	LOW
Stream Bank Sensitivity	LOW
Sideslope Sensitivity	MOD
Flood Plain Protection	N/A
Culvert/Fish Passage	LOW

Inchannel woody debris accumulations have limited influence on channel form and habitat capability due to the large degree of bedrock control. Large debris enters the channel primarily from stream sideslopes. High flows in these well contained channels tend to move all but the most stable wood accumulations downstream or push debris to channel margins.

Stream banks are generally stable due to bedrock influence. Sideslopes can be susceptible to mass wasting erosion in areas with higher than average sideslope angles, or in channel segments with weathered bedrock, glacial till, or volcanic ash parent materials. Road construction near LC1 channels should emphasize maintenance of channel sideslope stability (BMPs 14.2, 14.3, 14.7, 14.8).

These are generally classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991). Control of inchannel operations is another important riparian management concern (BMP 14.14).

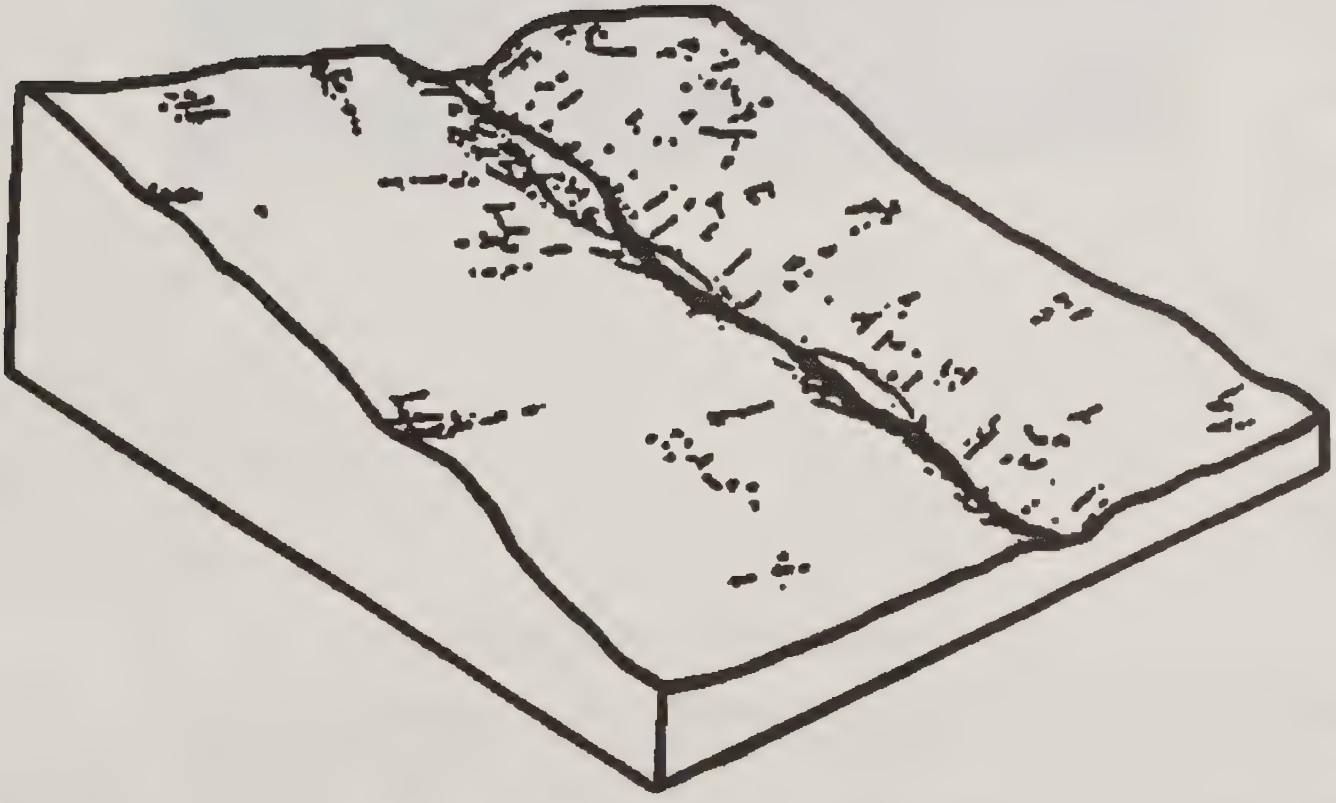
Riparian Management Opportunities:

Sport Fish Potential.....MODERATE
Enhancement Opportunities .....Large Wood Placement and Barrier Modification

Sport fishing opportunities are generally limited to bedrock scour pools and pools below water falls. Primary species of interest include steelhead, Dolly Varden, and pink salmon.

Opportunities exist for increasing limited rearing and spawning area by anchoring large pieces of wood in LC1 channels. Bedrock falls and cascades can be obstructions to upstream fish migration. Barrier modification may also be an enhancement opportunity

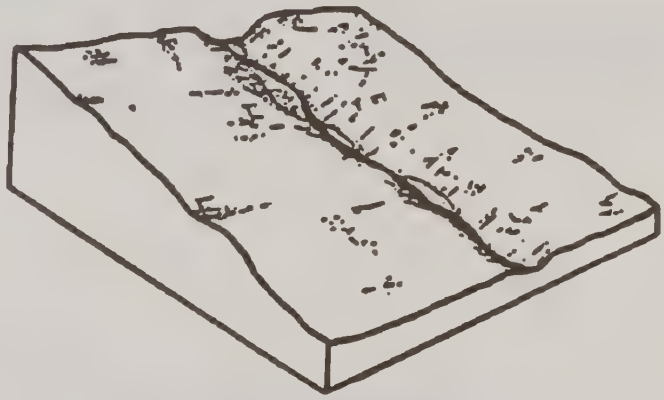
Large Contained Process Group



MODERATE GRADIENT CONTAINED NARROW VALLEY CHANNEL
Channel Mapping Symbol: LC2 (Formerly C5)

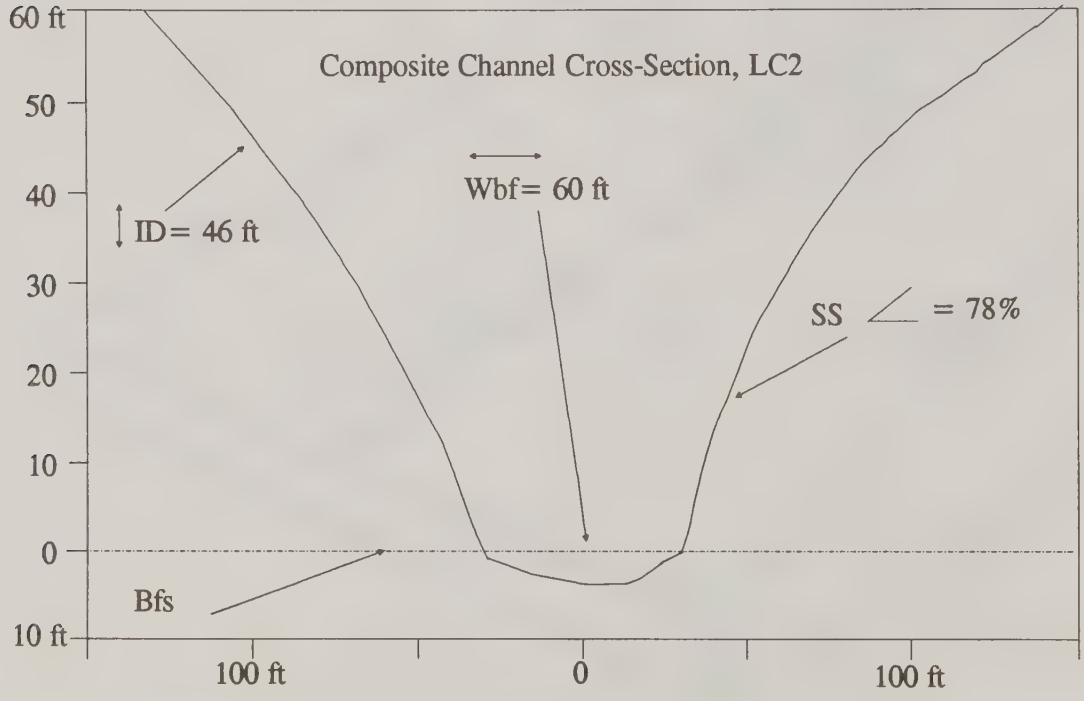
PHYSICAL CHARACTERISTICS

Geographic Setting: LC2 streams flow through narrow valleys situated in the middle to lower sections of a watershed. Hillslopes and mountainslopes composing the valley walls may lie directly adjacent to the LC2 channel. The adjacent valley floor is consistently narrow, with little river terrace development. Bedrock knickpoints, short falls, cascades, and boulder runs may be present.



Similar Channel Types: MC3, LC1

Channel Structure



Stream Gradient: .....<5%, mean = 2%
Incision Depth: .....Variable, mean = 14 m (46 ft)
Bankfull Width:.....10-30 m (33-99 ft), mean = 18 m (60 ft)
Dominant Substrate: .....Coarse gravel to bedrock
Stream Bank Composition: .....Bedrock or mixed
Sideslope Length: .....Variable, mean = 11m (35ft)
Sideslope Angle: .....Mean = 78% (38 degrees)
Channel Pattern:.....Single, linear
Drainage Basin Area:.....13-52 km^2 (5-20 mi^2)

Riparian Vegetation: The riparian plant communities are dominated by the western hemlock series, with western hemlock/blueberry being the most common plant association. The Sitka spruce series is also significant.

INCHANNEL PHOTO: LC2

Plant Association Series	% Cover
Western Hemlock	44%
Sitka Spruce	29%
Mountain Hemlock	9%
Mixed Conifer	8%
Western Hemlock-Alaska Cedar	6%
Nonforest	4%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: LC2 channels are sediment transport systems. Moderate gradient, well contained stream flow, and large clast substrate are indicative of high stream energy. Sediment inputs from upstream mountainslope channels are rapidly transported through these channels. Mass wasting along channel sideslopes is a major on-site contributor of sediment. Sediment contributions from stream banks are of minor significance because they are largely composed of bedrock or large rock fragments. Cobble and coarse gravel deposits are common substrate components around boulder clusters or large woody debris. Fine sediments are readily flushed through these streams.

Aquatic Habitat Capability

Large Woody Debris .....2500 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 11% for 10 sites
Available Rearing Area (ARA).....Avg = 15% for 10 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	MOD	MOD
Pink	LOW	NEG
Chum	LOW	NEG
Sockeye	LOW	NEG
Chinook	LOW	MOD
Dolly Varden	HIGH	HIGH
Steelhead	MOD	MOD

LC2 channels are frequently accessible to anadromous species, but often contain barriers that block upstream fish movement. Typically these streams get occasional use by spawning salmonids, however, Dolly Varden and steelhead show the most frequent use of spawning areas. These channels do have some good rearing areas, especially in reaches with stable large woody debris. Chinook salmon, Dolly Varden, and steelhead tend to favor rearing in LC2 channels more than coho due to availability of boulder-pool habitats.

Riparian Management Considerations

Concern for Management of:	
Large Woody Debris	LOW
Sediment Retention	LOW
Stream Bank Sensitivity	LOW
Sideslope Sensitivity	HIGH
Flood Plain Protection Need	N/A
Culvert Fish Passage	LOW

Large wood accumulations have limited influence on LC2 channel morphology. Relatively high stream energy in LC2 channel types tends to displace inchannel debris to bank areas. Total woody debris loading is moderate and is composed of large diameter (45.7-76.2 cm [18-30 inch]) pieces longer than 15.2 meters (50 feet) in length. Large wood incorporated into the stream bed can have an important function trapping gravel and cobble substrate used for spawning habitat.

Stream banks in LC2 channels are relatively stable due to the high amounts of bedrock and boulders incorporated into them. However, channel sideslopes are steep (75%) and susceptible to mass erosion if disturbed by road cuts, blowdown, or timber yarding. Riparian management should emphasize protection of unstable sideslopes (BMPs 13.5, 13.9).

Due to long, steep sideslopes adjacent to the channel, road crossings are generally not practical along LC2 channel types. Suitable crossing sites generally require multi-span bridges. Special road location and design (BMPs 14.2, 14.3), and slope stabilization measures (BMPs 14.7, 14.8) should be considered for these streams.

These are typically classified as Value Class I or II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

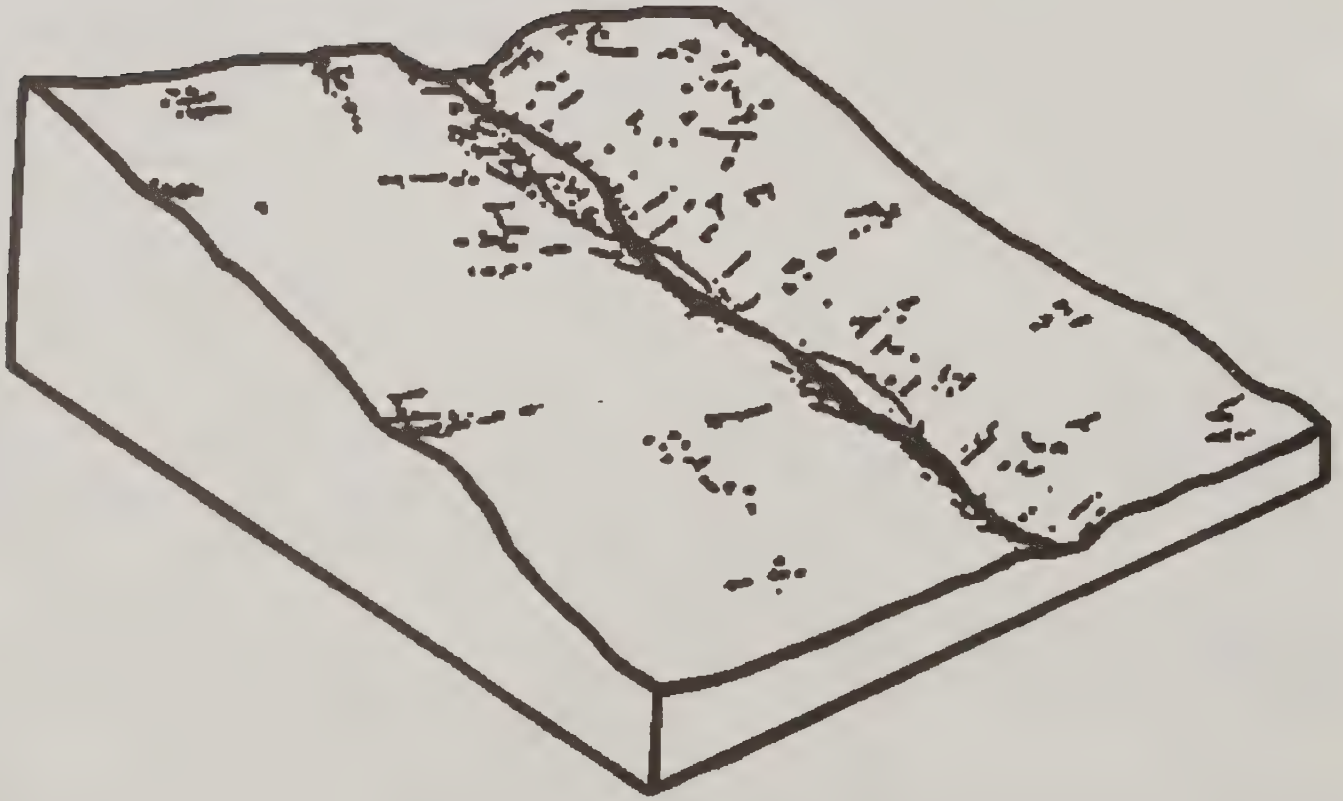
Riparian Management Opportunities:

Sport Fish Potential.....MODERATE
Enhancement Opportunities .....Barrier Removal

Some sport fish opportunities usually exist near the mouth of LC2 channel segments. Anadromous fish can usually access the lower reaches of these streams, but barrier falls and cascades are very common in LC2 segments. Species of interest include steelhead and cutthroat trout, coho and pink salmon, and Dolly Varden char. The best angling sites are in scour pools below falls and chutes.

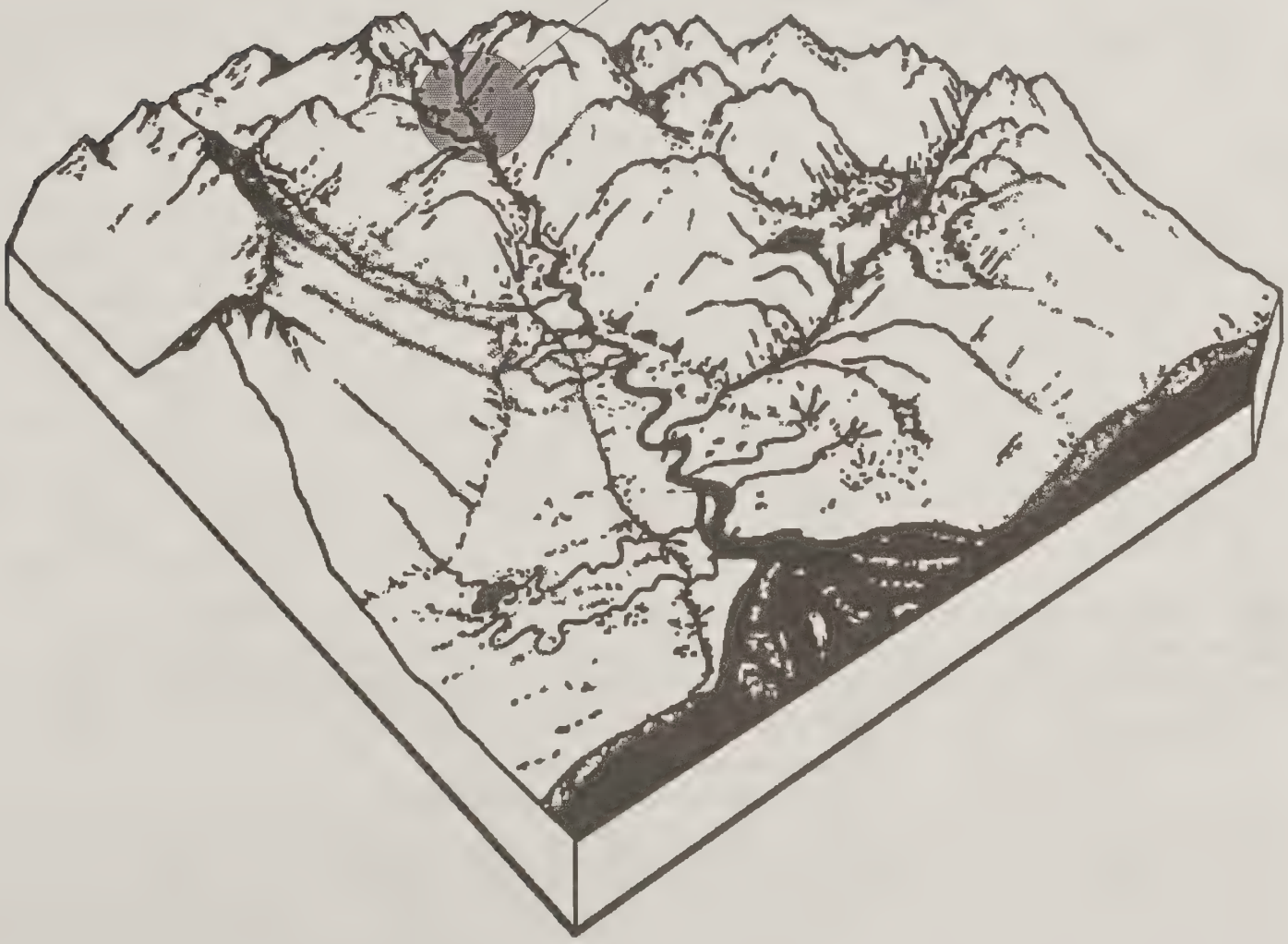
Barrier removal may be an enhancement option where sufficient high quality habitat occurs above LC2 channels and where falls are not too large or numerous to make fish ladder projects uneconomical. An alternative to barrier removal includes the creation or maintenance of quality resident fisheries above the barrier.

Large Contained Process Group



MODERATE GRADIENT MIXED CONTROL PROCESS GROUP

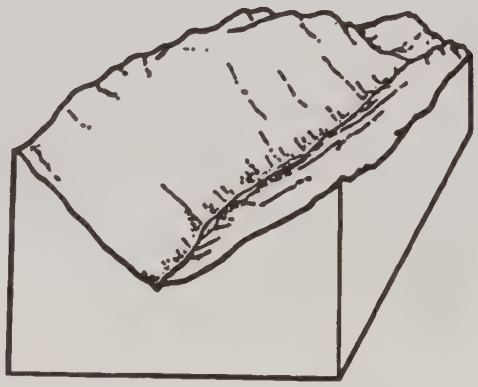
This process group includes MM1 (narrow) and MM2 (moderate width) mixed control channel types. These channel types are moderate gradient (2-6%) streams where sediment deposition processes are limited. Channel banks are frequently composed of boulder or bedrock materials that limit later channel migration and flood plain development along many segments of these channel types. High flows are mostly contained within the active stream channel. Riparian areas seldom extend beyond 30.5 meters (100 feet) from stream banks.



NARROW MIXED CONTROL CHANNEL
Channel Mapping Symbol: MM1 (Formerly B2)

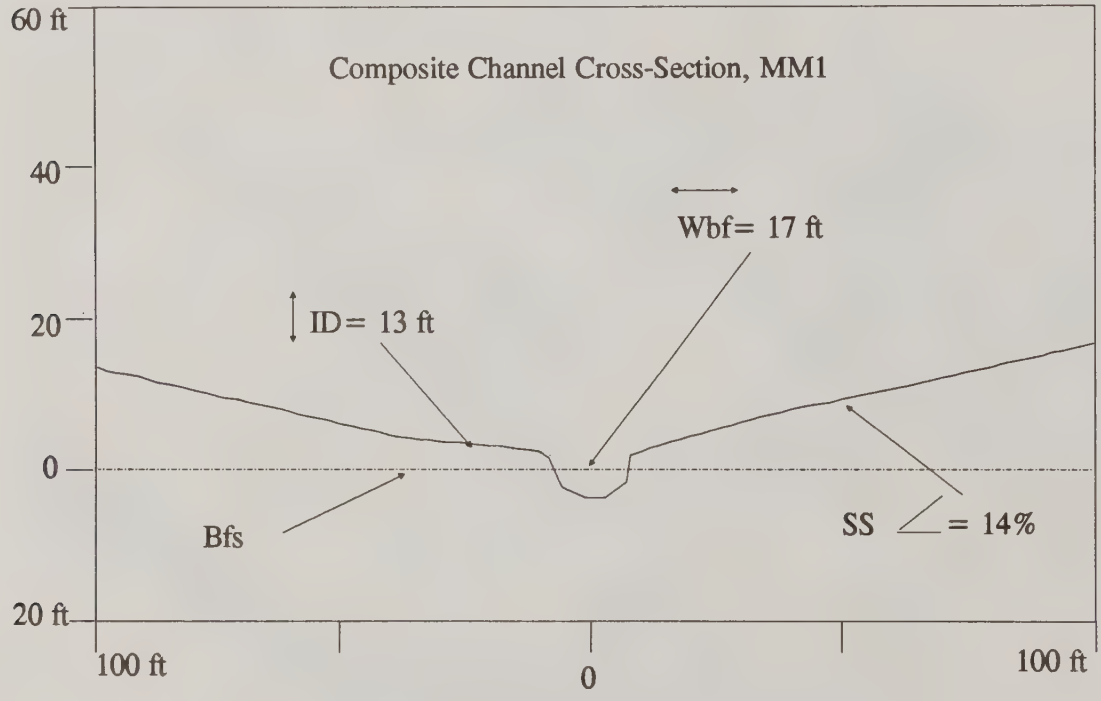
PHYSICAL CHARACTERISTICS

Geographic Setting: The MM1 stream is normally situated in the middle reaches of small drainage basins. Accordingly, drainage basin area is small. Commonly, an HC3 channel will precede an MM1 in the basin network. The MM1 will often flow into an MM2 reach. MM1 streams may also occur as upstream tributaries to FP3 and MC2 reaches. Bank material is normally a mixture of alluvial and colluvial deposits. Small bedrock knickpoints and short cascades or falls may be present.



Similar Channel Types: MM2, AF1

Channel Structure



Stream Gradient: .....2-6%, mean = 3%
Incision Depth: .....< or = 4 m (13 ft)
Bankfull Width:.....< or = 10 m (33 ft), mean = 5 m (17 ft)
Dominant Substrate: .....Fine gravel to large rubble (cobble)
Stream Bank Composition: .....Mixture of alluvium and colluvium
Sideslope Length: .....<50 m (165 ft), mean = 42 m (140 ft)
Sideslope Angle: .....Mean = 14% (8 degrees)
Channel Pattern:.....Linear to slightly sinuous, single channel
Drainage Basin Area:.....2.6-5.2 km^2 (1-2 mi^2)

INCHANNEL PHOTO: MM1

Riparian Vegetation: The riparian plant associations for the MM1 channel type are dominated by the Western hemlock series. Nonforested Sitka alder and willow shrub communities dominate the MM1s phase.

Plant Association Series	% Cover	
	MM1	MM1s
Western Hemlock	30%	---
itka Spruce	29%	9%
Mixed Conifer	14%	3%
Nonforest	12%	62%
Mountain Hemlock	6%	7%
Western Hemlock-Red Cedar	6%	3%
Shore Pine	---	9%
Sitka Spruce-Cottonwood	---	7%

Channel Type Phases:

- ☐ MM1s - SHRUB PHASE is typically situated in the upper valley reaches of a watershed. Snow avalanche slopes are proximal to this channel. Riparian vegetation consists of brush species (Sitka alder and willow). Rearing capability for this phase is less than is typical for this channel type due to a lack of rearing habitat associated with large wood.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: MM1 channels are sediment transport oriented. Sediment inputs come from upstream, high gradient, contained tributaries. Stream energy is moderate due to channel gradient and flow containment provided by stable alluvial/colluvial banks. Most fine sediment is readily transported through these streams to downstream reaches. Large woody debris volume is substantial, but has only moderate retention of sand and gravel size sediment in these reaches.

Aquatic Habitat Capability

Large Woody Debris .....4000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 11% for 68 sites
Available Rearing Area (ARA).....Avg = 18% for 68 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	MOD	MOD
Pink	MOD	NEG
Chum	MOD	NEG
Sockeye	LOW	NEG
Chinook	LOW	LOW
Dolly Varden	HIGH	HIGH
Steelhead	LOW	LOW

MM1 channels are generally accessible to anadromous fish species. Downstream barriers account for most cases where access is restricted. Occasionally barriers occur at bedrock falls within MM1 streams. These channels are frequented by spawning coho, and, to a lesser degree, by pink and chum spawners. Use by spawning Dolly Varden char is also high. Where located next to accessible lakes, these channels provide moderate quality spawning habitat for sockeye salmon and steelhead trout. Rearing coho and Dolly Varden char frequently use these channels. Overwintering habitat is available where inchannel woody debris is abundant.

Riparian Management Considerations

Concern for Management of:
Large Woody Debris .....MOD
Sediment Retention .....MOD
Stream Bank Sensitivity.....MOD
Sideslope Sensitivity.....LOW
Flood Plain Protection.....MOD
Culvert Fish Passage.....HIGH

Large woody debris volume is relatively high in MM1 channel types. The large woody debris plays an important role in trapping cobble and gravel substrate used by spawning fish, and in the formation of pool habitat for rearing fish.

Stream banks are composed mostly of coarsely textured alluvial and colluvial sediments that are only moderately sensitive to disturbance. Stream bank vegetation does play an important role in bank stabilization (BMP 13.16).

Upstream migration of fish is a major concern when planning for stream crossing structures. Moderate channel gradients (3% mean) make it difficult to maintain adult or juvenile salmonid passage through culvert structures (BMP 14.17). Control of inchannel operations is also an important riparian management concern for these streams (BMP 14.14).

These are classified as Value Class I streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

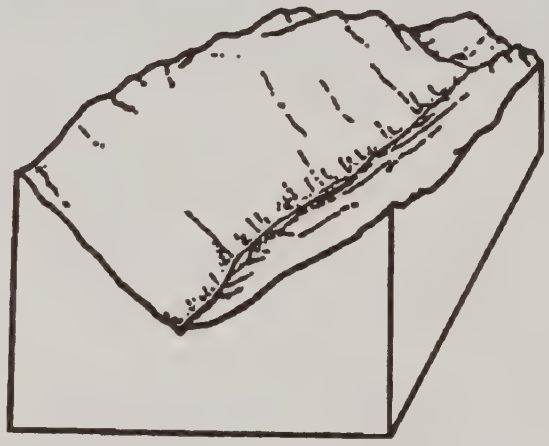
Sport Fish Potential..... LOW
Enhancement Opportunities ..... Large Wood Placement

Placement of large woody debris structures in MM1 channel types is a viable option for improving rearing habitat. Enhancement objectives should focus on creating deep pools that could provide overwinter rearing habitat. Creation of additional rearing area should be in proportion to the spawning habitat availability upstream.

MODERATE WIDTH MIXED CONTROL CHANNEL
Channel Mapping Symbol: MM2 (Formerly B3)

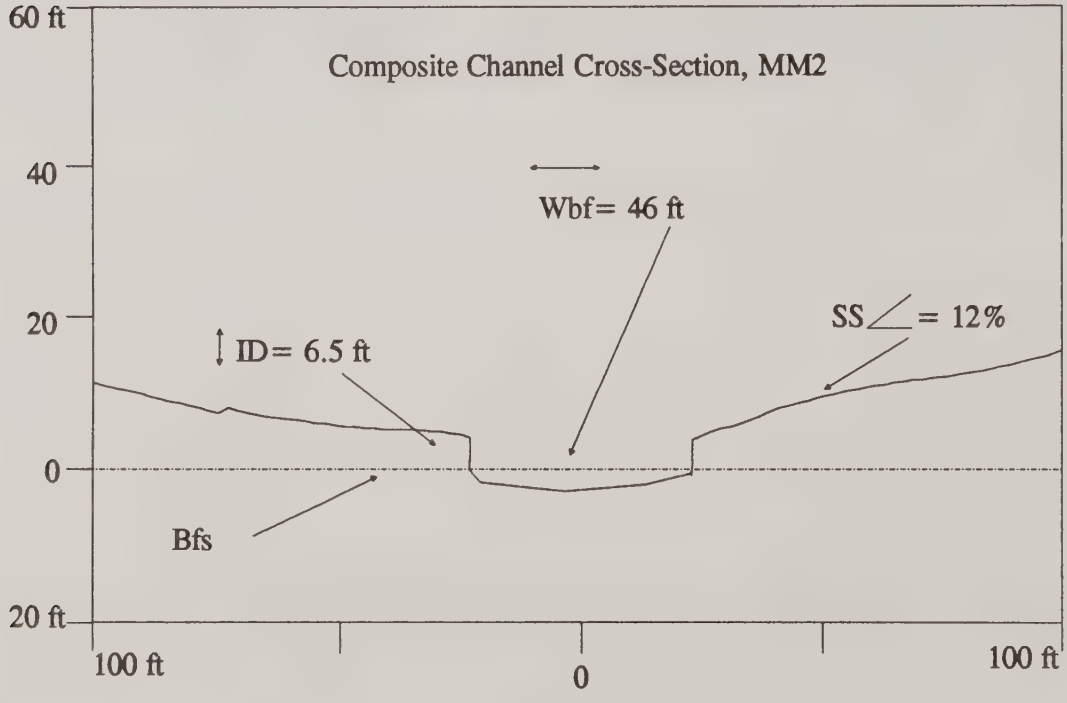
PHYSICAL CHARACTERISTICS

Geographic Setting: MM2 channels are normally found in the middle to lower portion of moderate size drainage basins. MM2 streams are often confined by mountainslope, footslope, and hillslope landforms, but they can develop a narrow flood plain. Bedrock knickpoints with cascades or falls may be present.



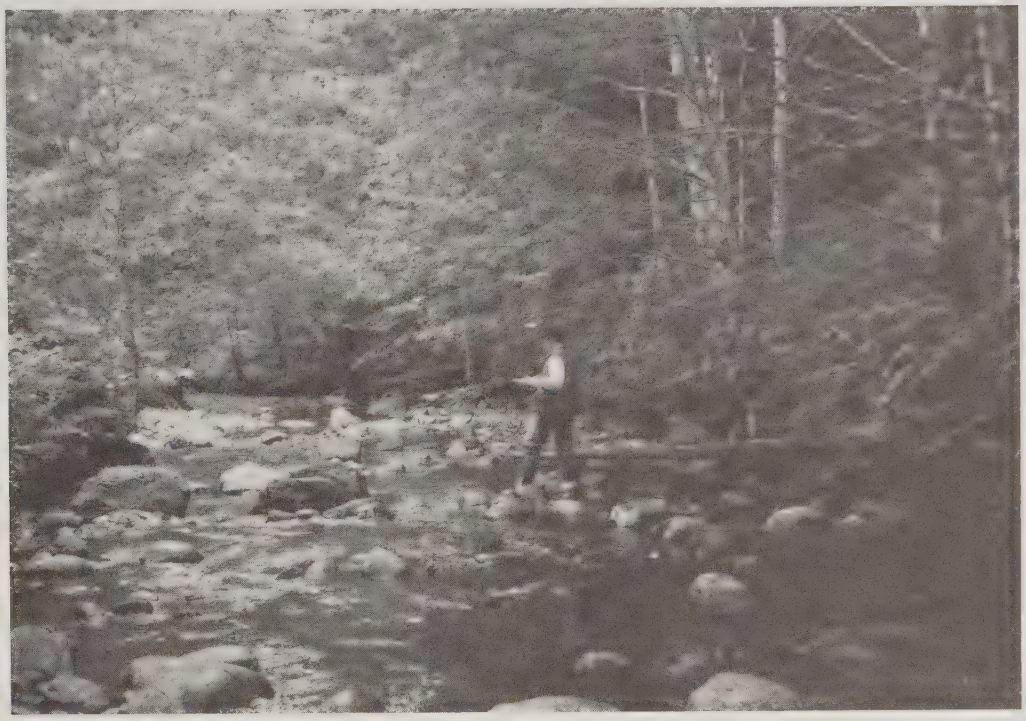
Similar Channel Types: HC3, MM1, MC2

Channel Structure



Channel Gradient:.....2-6%, mean = 3%
Incision Depth: .....< or = 4 m (13 ft), mean = 2 m (6.5 ft)
Bankfull Width:.....>10 m (33 ft), mean = 14 m (46 ft)
Dominant Substrate: .....Gravel to small boulder
Stream Bank Composition: .....Mixture of alluvium, colluvium, and bedrock
Sideslope Length: .....Variable, mean = 14 m (45 ft)
Sideslope Angle: .....Shallow, <20% (10 degrees), mean = 12% (7 degrees)
Channel Pattern:.....Single, moderately sinuous channel
Drainage Basin Area:.....5.2-13 km^2 (2-5 mi^2)

INCHANNEL PHOTO: MM2



INCHANNEL PHOTO: MM2s

Riparian Vegetation: The riparian plant communities for the MM2 channel type are dominated by the Sitka spruce series and the western hemlock series. Nonforested Sitka alder and willow plant communities are dominant in the MM2m phase.

Plant Association Series	% Cover MM2	MM2m
Sitka Spruce	48%	10%
Western Hemlock	26%	14%
Nonforest	13%	67%
Mixed Conifer	6%	---
Mountain Hemlock	4%	4%
Sitka Spruce-Cottonwood	---	4%

Channel Type Phases:

- ☐ MM2s - SHRUB PHASE is typically adjacent to steep mountainslopes subject to extensive snow avalanche activity. Riparian vegetation consists mainly of disturbance vegetation, alder and salmonberry. Large woody debris volume is comparatively low in this phase, therefore, fish capability may be lower.
- ☐ MM2m - MUSKEG PHASE is typically associated with glacially scoured lowland landforms. Riparian vegetation consists of mixed conifer scrub forest and muskeg bog species.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: MM2 channels function as sediment transport systems. These channels have moderate stream energy. Fine sediment is rapidly moved through the MM2 channels. Large woody debris accumulations are extensive and help retain coarse gravels, portions of which will be mobilized during high flow events. Significant stream bank erosion and lateral channel migration can occur during high flow periods.

Aquatic Habitat Capability

Large Woody Debris .....7000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 12% for 33 sites
Available Rearing Area (ARA).....Avg = 10% for 33 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	MOD	LOW
Pink	MOD	NEG
Chum	MOD	NEG
Sockeye	LOW	NEG
Chinook	HIGH	LOW
Dolly Varden	HIGH	HIGH
Steelhead	HIGH	MOD

MM2 channels are generally accessible to anadromous species, with several species of spawners using the moderate amounts of available spawning area (ASA). These channels have moderate amounts of rearing area which are used by coho, Dolly Varden char, and steelhead juveniles. Pools are relatively deep (mean pool depth = 0.41 meters [1.34 feet]), and are highly dependent on large woody debris. Overwintering habitat is primarily associated with these pools. When located next to accessible lakes, these channels provide good quality spawning for sockeye salmon and steelhead trout.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris ..... HIGH
Sediment Retention ..... MOD
Stream Bank Sensitivity ..... HIGH
Sideslope Sensitivity ..... LOW
Flood Plain Protection Need ..... MOD
Culvert/Fish Passage ..... HIGH

Large woody debris significantly influences channel morphology and fish habitat quality. Large wood volume is generally high. Large wood accumulations form pool and stream bank rearing habitat, as well as stabilize spawning substrate behind log steps. Maintenance of large woody debris sources is an important management concern (BMP 12.6).

Banks are composed primarily of unconsolidated cobble and gravel size materials, therefore, stream bank sensitivity is rated high. The volume and energy of flood discharge in MM2 channels are the major factors affecting bank erosion. Disturbance of streamside vegetation root mats may contribute to accelerated channel scour and lateral channel migration (BMPs 13.16, 14.17).

Flood plains associated with MM2 channel types are generally narrow, however, side channels and flood overflow channels are commonly found along MM2 reaches. Flood plain stability can be a concern in these uncontained channel segments (BMPs 12.6, 13.8, 14.13).

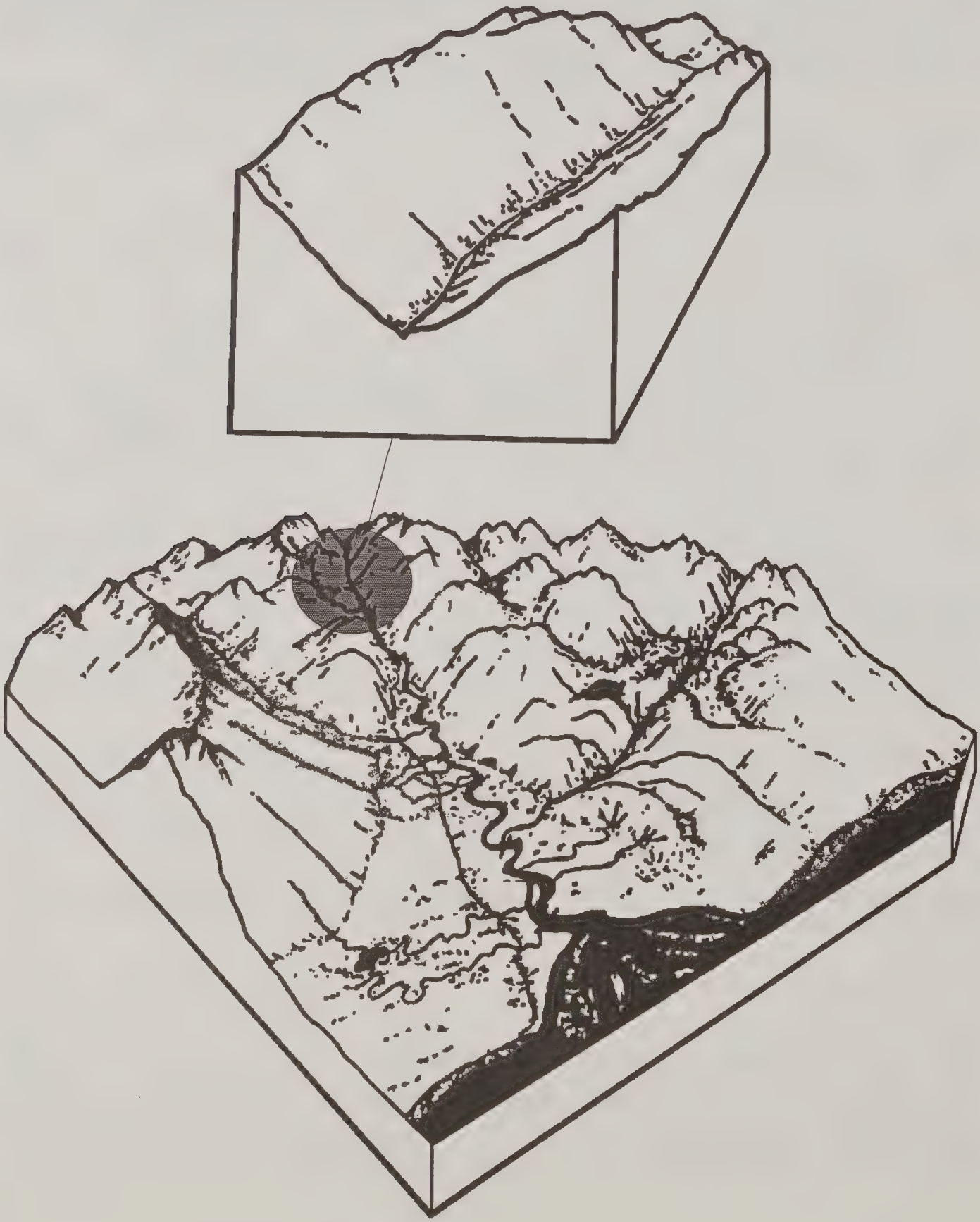
There is a high level of concern for providing fish passage through road crossing structures (BMP 14.17). Bridges are generally the appropriate stream crossing structures for MM2 channels. Culvert installations on these streams will not generally meet anadromous fish passage requirements. In addition, heavy woody debris loading and bedload sediment transport in MM2 channels pose a serious risk to culvert and bridge maintenance (BMP 14.20).

These are typically Value Class I or II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

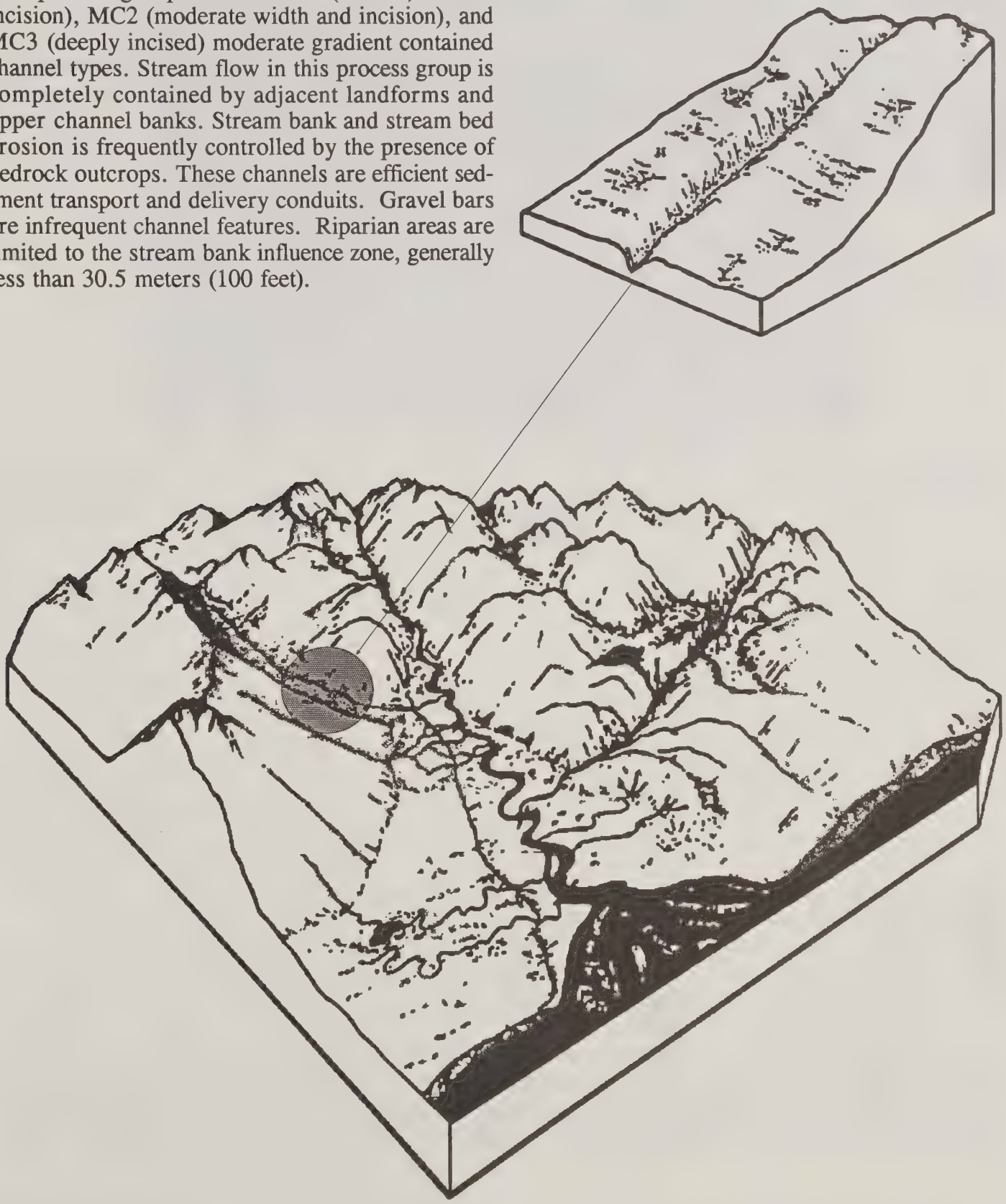
Sport Fish Potential ..... LOW
Enhancement Opportunities ..... Large Wood Placement

Much of the usable fish habitat in MM2 channel segments is keyed to large woody debris. Riparian management should emphasize future recruitment of large woody debris. Insertion of large wood structures is also an enhancement option.



MODERATE GRADIENT CONTAINED PROCESS GROUP

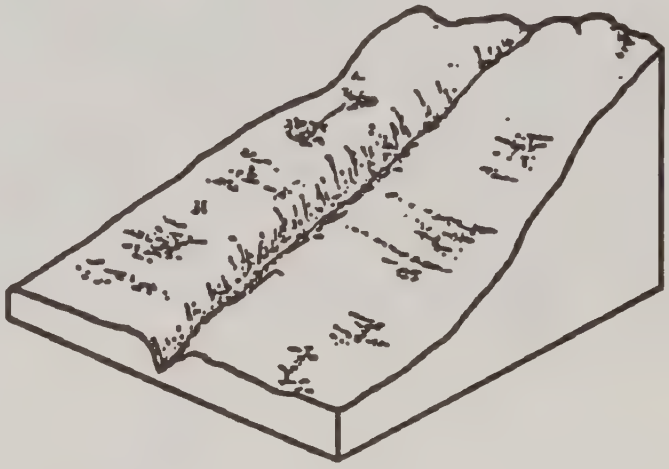
This process group includes MC1 (narrow, shallow incision), MC2 (moderate width and incision), and MC3 (deeply incised) moderate gradient contained channel types. Stream flow in this process group is completely contained by adjacent landforms and upper channel banks. Stream bank and stream bed erosion is frequently controlled by the presence of bedrock outcrops. These channels are efficient sediment transport and delivery conduits. Gravel bars are infrequent channel features. Riparian areas are limited to the stream bank influence zone, generally less than 30.5 meters (100 feet).



NARROW SHALLOW CONTAINED CHANNEL
Channel Mapping Symbol: MC1 (Formerly B4)

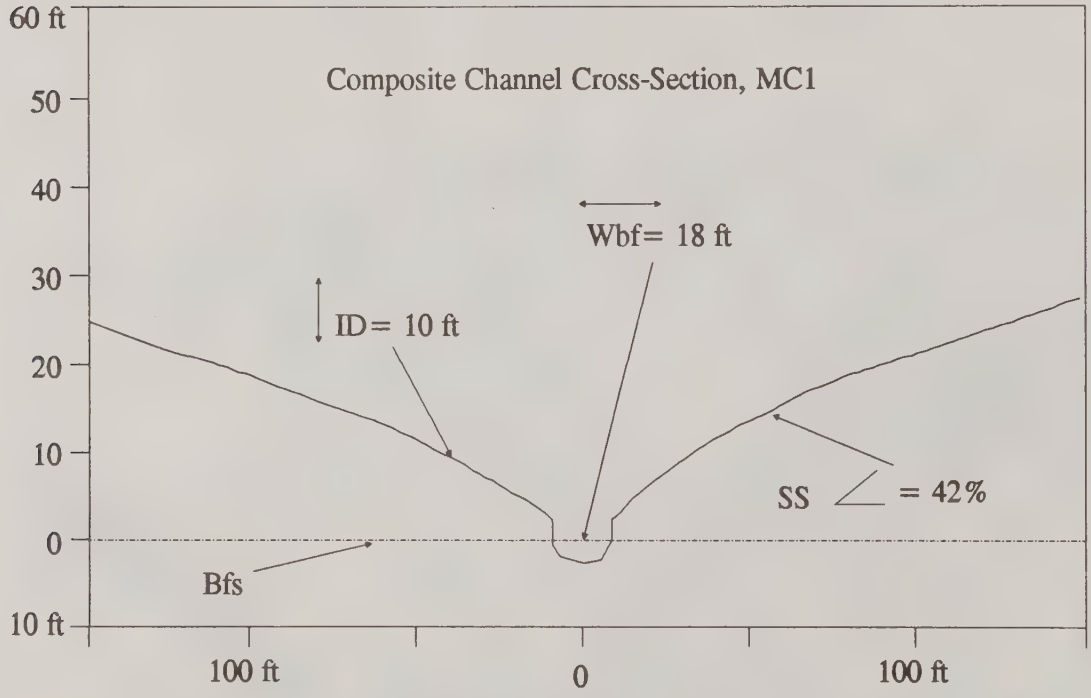
PHYSICAL CHARACTERISTICS

Geographic Setting: The MC1 is found consistently in glacially scoured lowland landforms. Hillslope landforms are often immediately adjacent to these streams. Less frequently, the MC1 is situated in middle to upper valley positions or low elevation drainage divides.



Similar Channel Types: MC2, MM1

Channel Structure



Stream Gradient: .....1-6%, mean = 3%
Incision Depth: .....<4 m (13 ft), mean = 3 m (10 ft)
Bankfull Width:.....<10 m (33 ft), mean = 6 m (18 ft)
Dominant Substrate: .....Cobble to bedrock
Stream Bank Composition: .....Bedrock or mixed
Sideslope Length: .....Variable, <20 m (66 ft), mean = 14 m (45 ft)
Sideslope Angle: .....Mean = 42% (25 degrees)
Channel Pattern:.....Single, linear rectangular pattern
Drainage Basin Area:.....2.6-5.2 km^2 (1-2 mi^2)

INCHANNEL PHOTO: MC1

Riparian Vegetation: The riparian plant communities are dominated by the mixed conifer series, with significant components of nonforested plant communities, shore pine series, and western hemlock series. The nonforested component is predominantly muskeg bog communities.

Plant Association Series	% Cover
Mixed Conifer	27%
Nonforest	18%
Western Hemlock	15%
Shore Pine	14%
Western Hemlock-Red Cedar	8%
Mountain Hemlock	7%
Western Hemlock-Alaska Cedar	7%

Channel Type Phases:

- ☐ MC1m - MUSKEG PHASE is typically a high energy system with muskeg bog and shrub riparian vegetation. Fish habitat associated with large woody debris may be less in this phase than is typical for MC1 channel types.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: MC1 channels function as sediment transport systems. Moderate gradients and flow containment result in moderate stream energy. Material delivered by high gradient, contained channels is quickly transported downstream. Inchannel storage of fine sediment (sands and gravels) is minor. Stream banks and sideslopes contribute very little to sediment loads in MC1 channels.

Aquatic Habitat Capability

Large Woody Debris ..... < 1000 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 5% for 24 sites
Available Rearing Area (ARA).....Avg = 15% for 24 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	MOD
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	LOW	LOW
Steelhead	NEG	NEG

MC1 channels are generally not accessible to anadromous species because of downstream barriers. Where accessible, spawning habitat is limited, with spawning gravels occurring in patches separated by bedrock or boulder substrate. Coho salmon and Dolly Varden char spawn in these channels. While the ARA is rated low to moderate, coho and Dolly Varden use the pools (19% of active water) for summer rearing. Overwintering habitat is minimal, due to the relatively shallow pools (mean depth = 0.18 meters [0.6 feet]).

Riparian Management Considerations

Concern for Management of:
Large Woody Debris ..... LOW
Sediment Retention ..... LOW
Stream Bank Sensitivity ..... LOW
Sideslope Sensitivity ..... LOW
Flood Plain Protection Need ..... N/A
Culvert Fish Passage..... LOW

The MC1 channel type is very stable with few water quality, fish habitat, or riparian management concerns. These are well contained channels with significant bedrock control for stream banks and stream bed. Sediment retention is low due to moderate gradient and limited sediment sources from stable sideslopes.

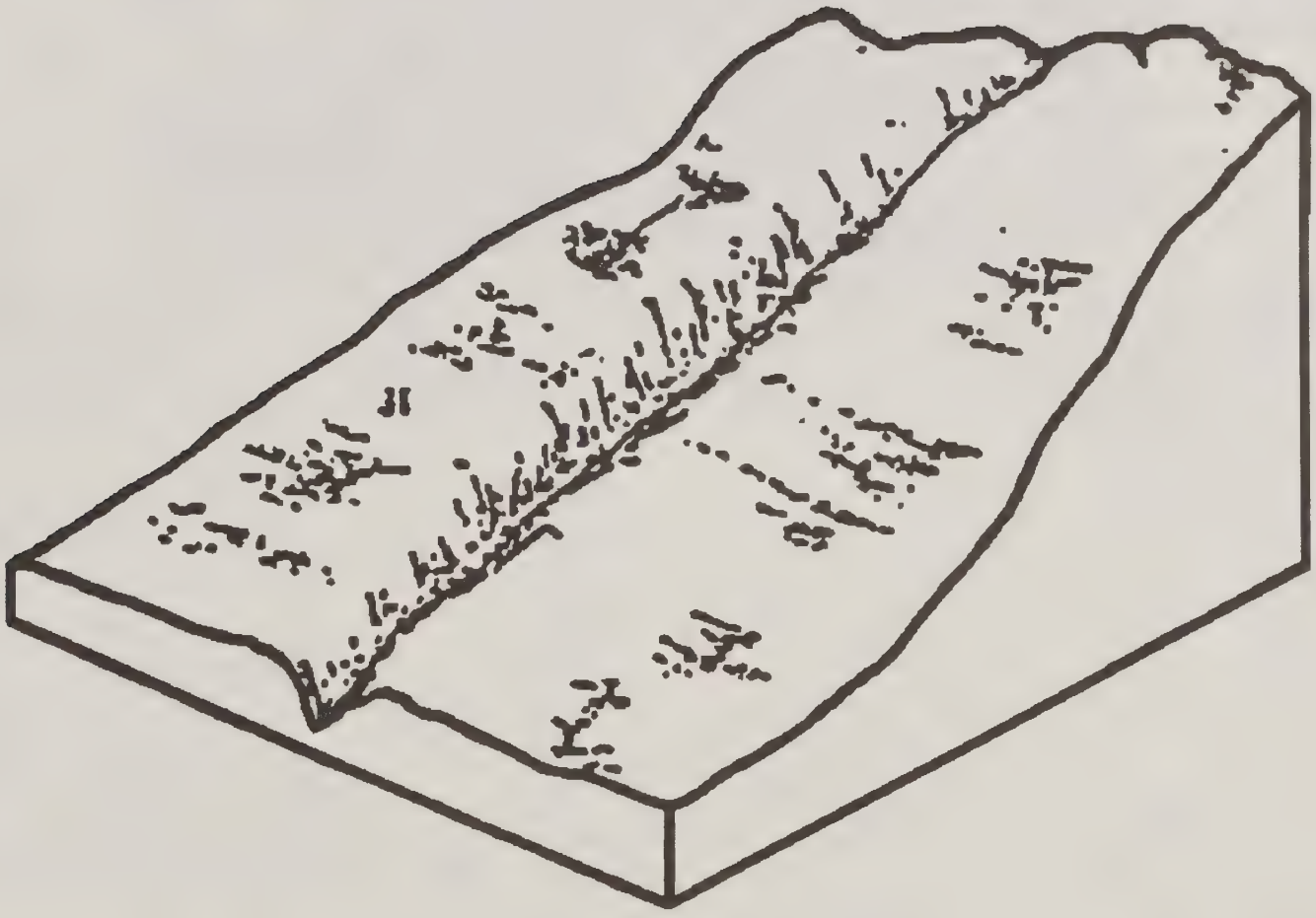
Upper segments of MC1 channels and most headwater reaches are not accessible to anadromous fish, however, anadromous fish passage through culvert crossings can be an important management concern in some stream segments (BMP 14.17).

These are generally classified as Value Class I or II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential..... N/A
Enhancement Opportunities ..... N/A

Moderate Gradient Contained Process Group



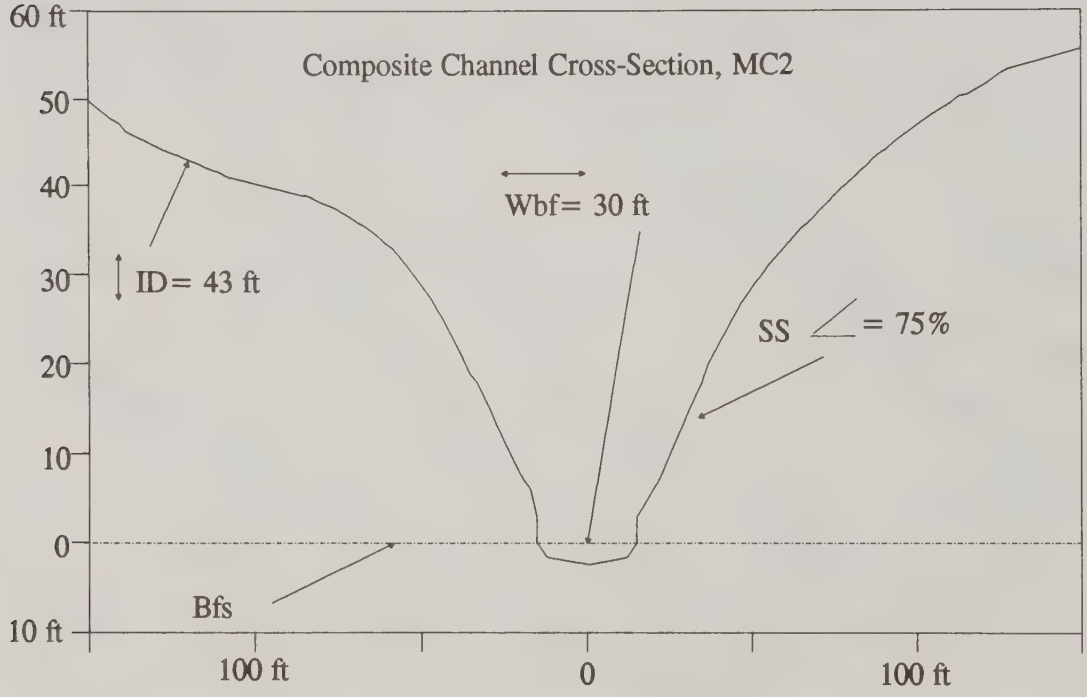
MODERATE WIDTH AND INCISION, CONTAINED CHANNEL
Channel Mapping Symbol: MC2 (Formerly B6)

PHYSICAL CHARACTERISTICS

Geographic Setting: MC2 channels are associated with glacially scoured lowland and low relief hillslope landforms. These well contained channels are confined by adjacent landforms. MC2 channels are typically main tributary or upper valley streams with small to moderate sized drainage basins. Bedrock control of channel banks and stream bed is prevalent, resulting in a single linear to rectangular channel pattern.

Similar Channel Types: HC4, HC2, MC1

Channel Structure



Stream Gradient: .....2-6%, mean = 3%
Incision Depth: .....4-20 m (13-66 ft), mean = 13 m (43 ft)
Bankfull Width:.....<20 m (66 ft), mean = 9 m (30 ft)
Dominant Substrate: .....Cobble to bedrock
Stream Bank Composition: .....Bedrock to mixed
Sideslope Length: .....4-20 m (13-66 ft), mean = 11m (37 ft)
Sideslope Angle: .....Mean = 75% (37 degrees)
Channel Pattern:.....Single, linear channel
Drainage Basin Area:.....5.2-13 km^2 (2-5 mi^2)

INCHANNEL PHOTO: MC2

Riparian Vegetation: The dominant riparian plant community is the western hemlock series, with western hemlock/blueberry being the most common plant association. The mixed conifer series and the Sitka spruce series are also significant riparian vegetation components. Nonforested plant communities are important stream edge communities with red alder and muskeg bog being the most dominant.

Plant Association Series	% Cover
Western Hemlock	40%
Mixed Conifer	15%
Sitka Spruce	14%
Western Hemlock-Alaska Cedar	11%
Nonforest	6%
Mountain Hemlock	6%
Western Hemlock-Red Cedar	5%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: MC2 channels are sediment transport systems. Stream energy is high due to moderate channel gradient and high flow containment. As a result, inchannel sediment storage, as gravel bars, is low. Fine sediment is easily flushed through these channels. Stream bank erosion is variable due to a high degree of bedrock control. Shallow mass wasting of weathered bedrock and poorly consolidated glacial till on channel sideslopes, though generally not frequent, is a primary source of sediment in MC2 channels.

Aquatic Habitat Capability

Large Woody Debris .....5700 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = < 1% for 19 sites
Available Rearing Area (ARA).....Avg = 11% for 19 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	MOD
Pink	LOW	NEG
Chum	LOW	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	MOD	MOD
Steelhead	LOW	MOD

MC2 channels are moderately accessible to anadromous species as migration barriers frequently occur within these reaches. Coho and Dolly Varden will use isolated pockets of spawning gravel. Coho, steelhead, and Dolly Varden will take advantage of the moderate ARA (11%). Most rearing habitat is associated with pools (11% of water surface area) that have cover provided by large debris jams and boulders. Overwintering habitat is marginal in MC2 channels. Other anadromous species make minimal use of available spawning and rearing areas.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris ..... MOD
Sediment Retention ..... LOW
Stream Bank Sensitivity ..... LOW
Sideslope Sensitivity ..... MOD
Flood Plain Protection..... N/A
Culvert/Fish Passage ..... LOW

Large woody debris volume is moderately high in MC2 channels, however, much of this debris is suspended above the level of normal stream flow stage and along channel banks. Therefore, in many stream segments, large woody debris may not contribute significantly to inchannel habitat. Debris transport is less than in larger contained channels, such as LC1 and LC2 channel types, due to lower flow volume. The limited spawning and rearing habitat available in MC2 stream segments is mostly associated with woody debris. Much of this debris is derived from shallow mass wasting and blow down along steep (75%) channel sideslopes. Debris jams trap bedload sediment and are important in maintaining pool habitat. Therefore, management of large woody debris recruitment is a moderate concern (BMP 12.6).

Shallow organic soils and weathered bedrock along MC2 sideslopes are susceptible to mass wasting. Stream sideslope disturbance from road construction (BMPs 14.7, 14.8, 14.12) is a moderate concern. These potentially unstable areas should be considered in the location, design, and construction of roads within MC2 riparian areas (BMPs 14.2, 14.3).

Suitable bridge crossing sites can be difficult to find on MC2 channels because of moderate channel incision depth and steep channel sideslopes. Culverts are not generally appropriate crossing structures in these channels because of high flow volume and debris transport potential. Anadromous fish passage is another common concern for crossing structure design and maintenance (BMPs 14.17, 14.20).

These are generally classified as Value Class I or II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

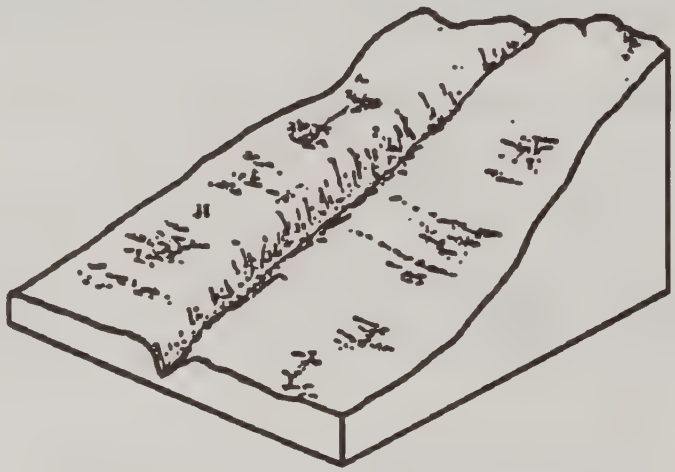
Sport Fish Potential..... LOW
Enhancement Opportunities ..... Large Wood Placement and Barrier Modification

Placement of large wood structures can be utilized to improve marginal spawning and rearing habitat. Boulder and rock structures can also be used effectively to enhance habitat in MC2 channel types. Barrier modification is viable in some situations where falls are not numerous and sufficient upstream habitat exists.

DEEPLY INCISED CONTAINED CHANNEL
Channel Mapping Symbol: MC3 (Formerly B7)

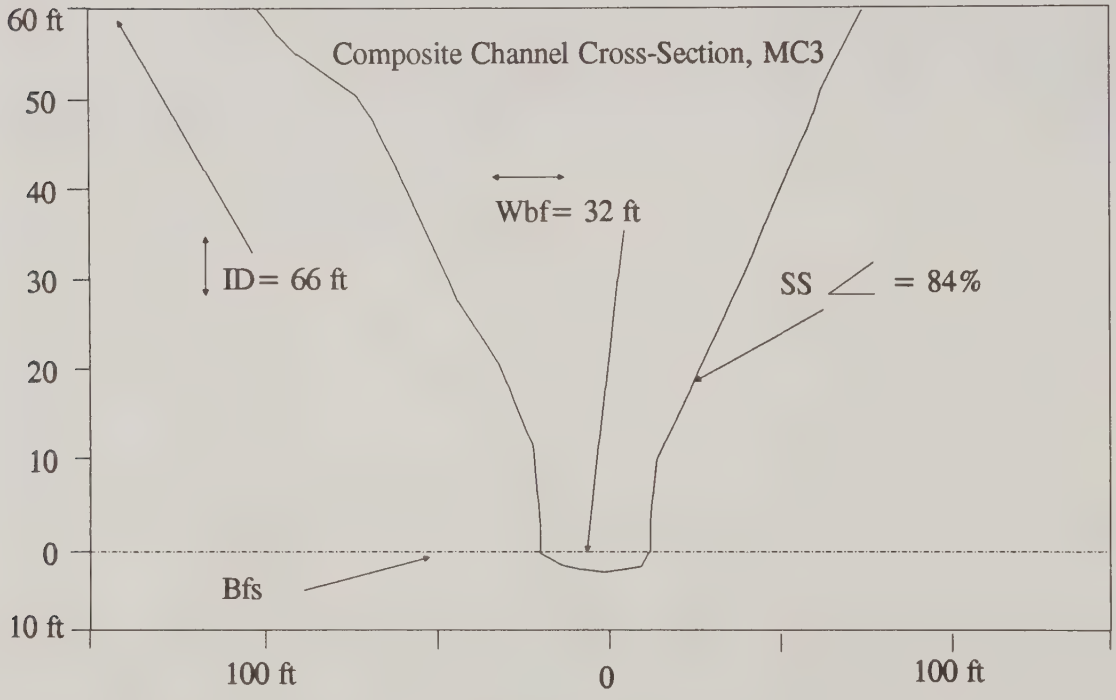
PHYSICAL CHARACTERISTICS

Geographic Setting: MC3 streams are exclusively associated with the valley bottom gorge landform (54). This channel typically cuts through bedrock and has very long, steep, sideslope walls. One or more major falls are normally present.



Similar Channel Types: HC3, HC8, LC2

Channel Structure



Stream Gradient: .....>4%, mean = 5%
Incision Depth: .....>10 m (33 ft), mean = 20 m (66 ft)
Bankfull Width:.....<20 m (66 ft), mean = 10 m (32 ft)
Dominant Substrate: .....Small cobble to bedrock
Stream Bank Composition: .....Bedrock
Sideslope Length: .....>15 m (50 ft), mean = 20 m (66 ft)
Sideslope Angle: .....Can be vertical, mean = 84% (40 degrees)
Channel Pattern:.....Single, linear channel
Drainage Basin Area:.....2.6-13 km^2 (1-5 mi^2)

INCHANNEL PHOTO: MC3

Riparian Vegetation: The western hemlock series is the dominant riparian plant community, with western hemlock/blueberry being the most common plant association. The Sitka spruce series and the nonforested plant communities are also significant. Nonforested plant communities, dominated by Sitka alder and devil's club shrub communities, occur as a fringe 23 percent of the time.

Plant Association Series	% Cover
Western Hemlock	54%
Sitka Spruce	12%
Nonforest	12%
Mixed Conifer	10%
Western Hemlock	8%
Western Hemlock-Alaska Cedar	5%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: Regardless of the position of MC3 channels in the watershed network, they function as sediment transport systems. High gradient tributary channels route sediment to the MC3 streams. Bedrock falls, boulder strewn cascades, and steep gradient chutes are common channel features. High stream energy results in efficient transport of both coarse bedload sediment and fine sediment particles.

Aquatic Habitat Capability

Large Woody Debris .....Insufficient data
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	LOW
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	LOW	MOD
Steelhead	LOW	LOW

These channels have very limited accessibility to anadromous species due to passage barriers within them. Typically, MC3 channels may get limited use from spawning steelhead and coho salmon, because spawning gravels tend to be scattered in small pockets. Dolly Varden char will also spawn in MC3 channels. Rearing coho occasionally make minor use of these streams. Dolly Varden and steelhead often rear in boulder pool habitats and overwinter in deep scour pools (mean depth 0.49 meters [1.6 feet]).

Riparian Management Considerations:

Concerns for Management of:

Large Woody Debris	LOW
Sediment Retention	LOW
Stream Bank Sensitivity	LOW
Sideslope Sensitivity	HIGH
Flood Plain Protection	N/A
Culvert Fish Passage	N/A

The large amount of bedrock and boulders create stable stream banks in MC3 channels, however, sideslopes are very steep and extremely unstable. Removal of trees along the steep sideslopes further reduces stability (BMPs 13.2, 13.5, 13.9). Downstream water quality impact associated with mass wasting of MC3 stream sideslopes is a primary management concern.

Stream crossings are rarely feasible on MC3 segments due to precipitous sideslopes and wide gorges (BMPs 14.2, 14.3).

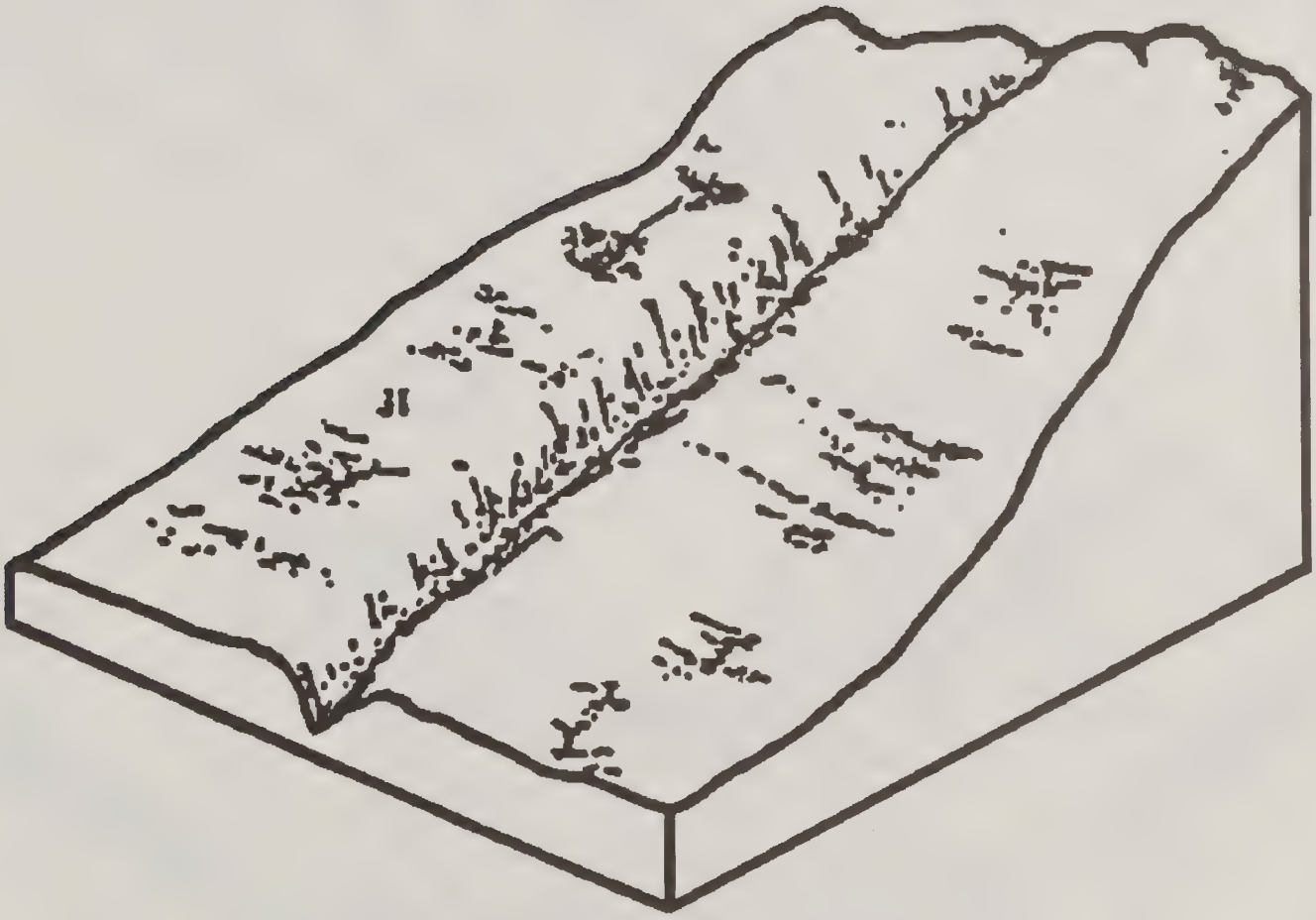
These are typically classified as Value Class II streams. A minimum 100 foot timber harvest buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities:

Sport Fish Potential	N/A
Enhancement Opportunities	N/A

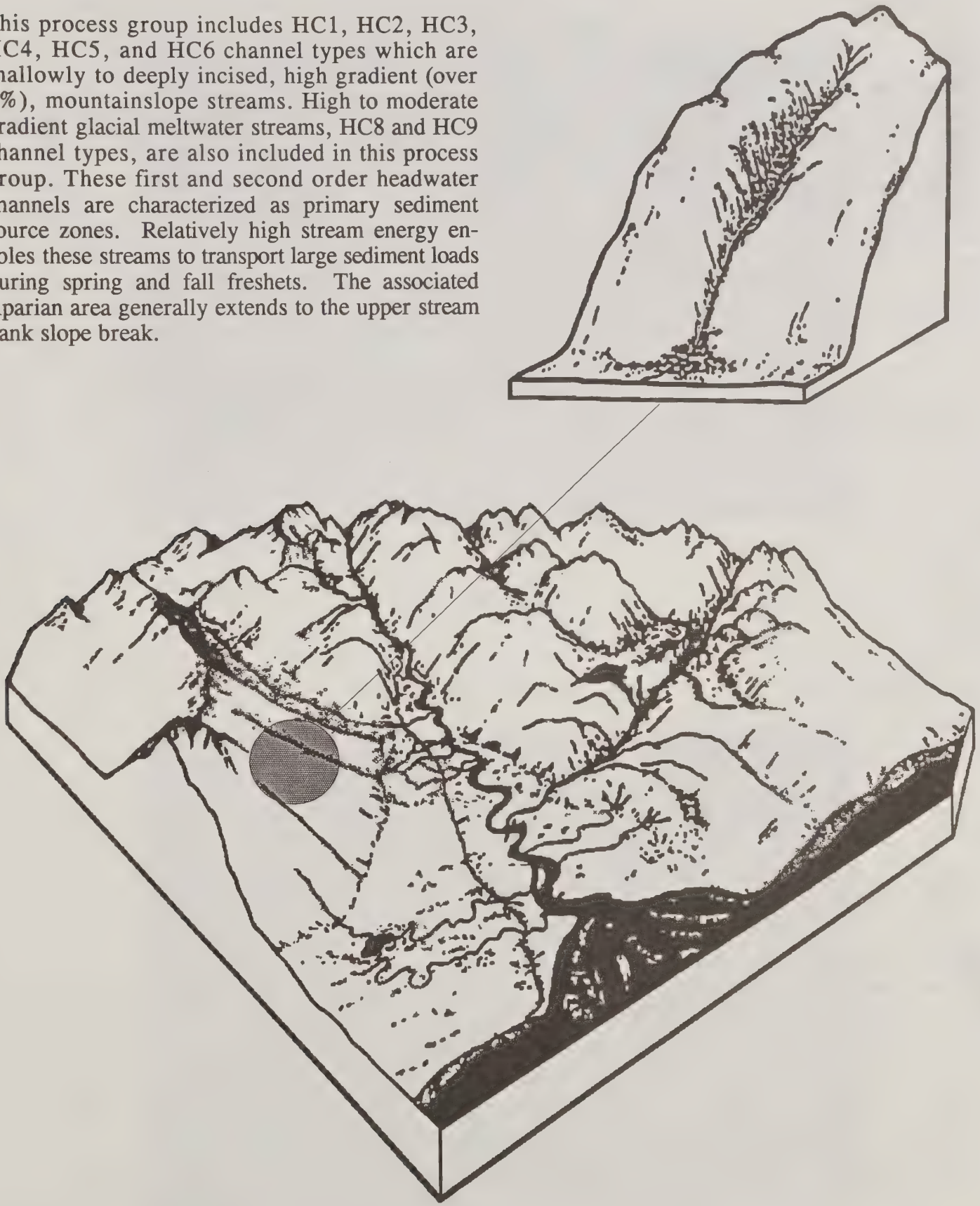
Large waterfalls are common on MC3 channels. Viewing these falls may provide a recreational opportunity where safe access can be provided.

Moderate Gradient Contained Process Group



HIGH GRADIENT CONTAINED PROCESS GROUP

This process group includes HC1, HC2, HC3, HC4, HC5, and HC6 channel types which are shallowly to deeply incised, high gradient (over 6%), mountainslope streams. High to moderate gradient glacial meltwater streams, HC8 and HC9 channel types, are also included in this process group. These first and second order headwater channels are characterized as primary sediment source zones. Relatively high stream energy enables these streams to transport large sediment loads during spring and fall freshets. The associated riparian area generally extends to the upper stream bank slope break.



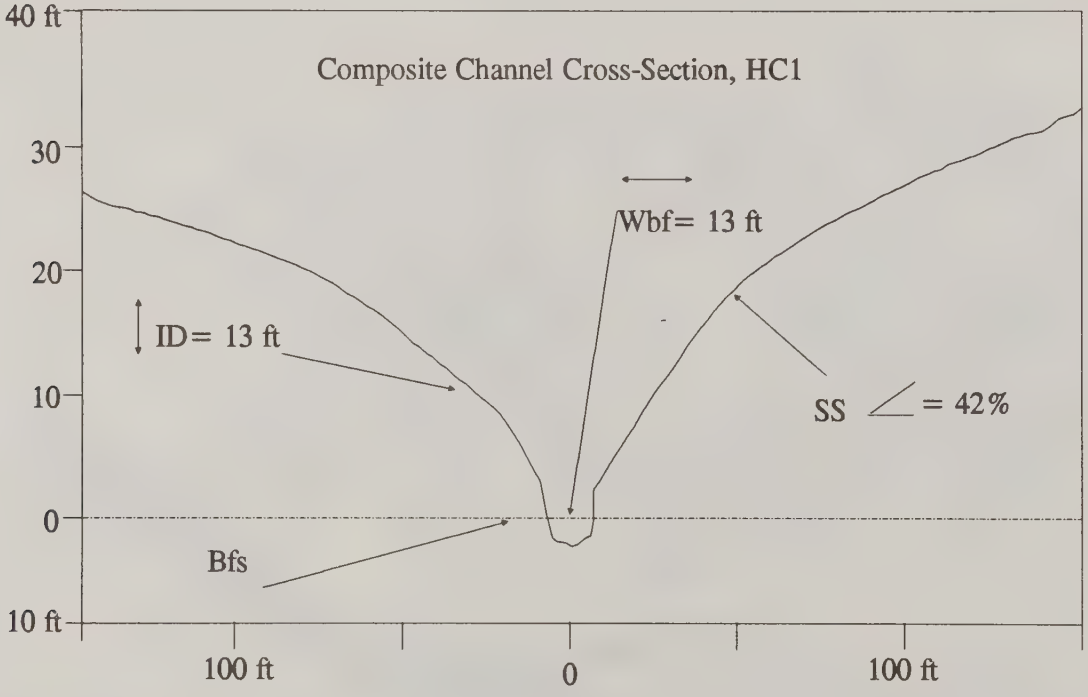
SHALLOWLY INCISED MUSKEG CHANNEL
Channel Mapping Symbol: HC1 (Formerly A6)

PHYSICAL CHARACTERISTICS

Geographic Setting: HC1 streams are mostly restricted to hill and lowland landforms. The HC1 channel type consists of narrow, high gradient, shallow to moderately incised streams. HC1 streams are commonly tributaries to MC1 and MC2 channel types. They also occur in conjunction with HC3 streams, where localized geologic knickpoints influence incision depth. Although not deeply incised, they are well contained and are usually influenced by bedrock control.

Similar Channel Types: HC2, HC4

Channel Structure



Stream Gradient: .....6-15%, mean = 9%
Incision Depth: .....< 6 m (20 ft), mean = 4 m (13 ft)
Bankfull Width:.....1-8 m (3-26 ft), mean = 4 m (13 ft)
Dominant Substrate: .....Small cobble to bedrock
Stream Bank Composition: .....Mixed to bedrock
Sideslope Length: .....< 10 m, mean = 7.3 m (24 ft)
Sideslope Angle: .....Mean = 42% (23 degrees)
Channel Pattern:.....Single, linear
Drainage Basin Area:.....< 2.6 km^2 (< 1 mi^2)

LANDSCAPE PHOTO: HC1

INCHANNEL PHOTO: HC1

Riparian Vegetation: The riparian plant communities are dominantly mixed conifer series. Other common riparian communities include western hemlock series, western hemlock/Alaska cedar series, and nonforested muskeg or meadow communities.

Plant Association Series	% Cover
Mixed Conifer	44%
Nonforest	14%
Mountain Hemlock	11%
Western Hemlock	11%
Western Hemlock-Alaska Cedar	9%
Sitka Spruce-Cottonwood	4%
Western Hemlock-Red Cedar	4%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: HC1 channels are sediment transport systems. They receive material from headwater mass wasting and hillslope erosion processes. Stream banks and sideslopes are typically quite stable, so only minor amounts of sediment and debris are introduced locally. Steep gradients and moderate stream power result in little inchannel sediment storage.

Aquatic Habitat Capability

Large Woody Debris	Insufficient data
Available Spawning Area (ASA)	Insufficient data
Available Rearing Area (ARA)	Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	LOW
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	LOW	MOD
Steelhead	NEG	NEG

HC1 channels have limited fish access due to high stream flow velocities and numerous barriers. These channels may get occasional use by anadromous species at their confluence with lower gradient channels. Little spawning and rearing habitat is available, however, limited use by resident Dolly Varden char can occur. Overwintering habitat is insignificant. As source waters, these channels can affect downstream anadromous fish habitat through transport of sediment, large woody debris, nutrients, and aquatic insects.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris .....LOW
Sediment Retention .....LOW
Stream Bank Sensitivity.....LOW
Sideslope Sensitivity.....LOW
Flood Plain Protection.....N/A
Culvert Fish Passage .....N/A

Few management concerns are associated with HC1 channels. Stream banks are bedrock controlled and relatively stable. Moderate sideslope angles and channel incision contribute to sideslope stability.

These are classified as Value Class II or III streams. A minimum 100 foot timber harvest buffer is occasionally required where significant resident fish populations occur (Tongass Timber Reform Act, 1991).

If stream harvest buffers are not required (Class III channels), harvest unit design should account for water quality protection requirements for these streams (BMPs 13.2, 13.3).

Riparian Management Opportunities:

Sport Fish Potential.....N/A
Enhancement Opportunities .....N/A

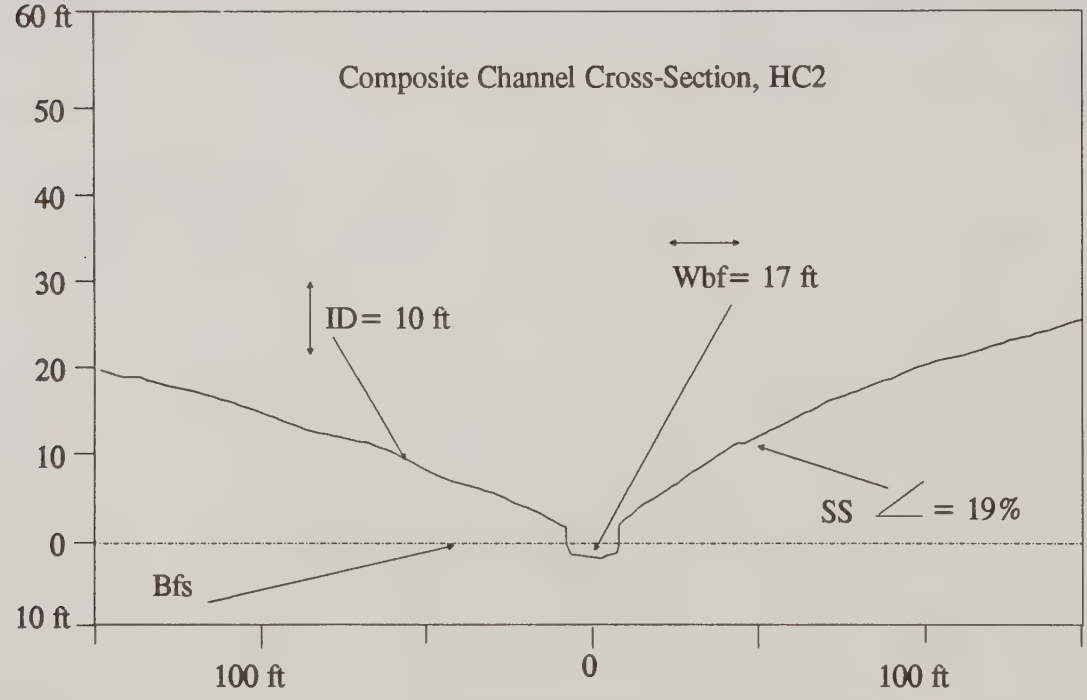
SHALLOWLY TO MODERATELY INCISED FOOTSLOPE CHANNEL
Channel Mapping Symbol: HC2 (Formerly A7)

PHYSICAL CHARACTERISTICS

Geographic Setting: The HC2 streams are predominantly associated with footslope landforms. Hill landforms are less frequently found adjacent to these channels. The HC2 channel type consists of high gradient, footslope streams, well contained by moderate (less than 10 meters [33 feet]) sideslope development. HC5 and HC6 channels commonly grade into an HC2 channel. HC2 channels are often tributaries to MM1 or MM2 streams. Stream bank composition is predominantly alluvium, although bedrock segments may occur as inclusions.

Similar Channel Types: AF2, MM2

Channel Structure



Stream Gradient: .....6-15%, mean = 10%
Incision Depth: .....1-10 m (3-33 ft), mean = 3 m (10 ft)
Bankfull Width:.....1-15 m (3-50 ft), mean = 5 m (17 ft)
Dominant Substrate: .....Coarse gravel to small boulder
Stream Bank Composition: .....Alluvium or colluvium
Sideslope Length: .....<15 m (50 ft), mean = 10 m (33 ft)
Sideslope Angle: .....<30%, mean = 19% (11 degrees)
Channel Pattern:.....Single, linear
Drainage Basin Area:.....<2.6 km^2 (<1 mi^2)

INCHANNEL PHOTO: HC2

Riparian Vegetation: The riparian plant communities are dominantly western hemlock series, with western hemlock/blueberry the most common plant association. The nonforested communities and Sitka spruce series are also well represented. Nonforested salmonberry, Sitka alder, and red alder shrub communities occur adjacent to the stream 46 percent of the time.

Plant Association Series	% Cover
Western Hemlock	38%
Nonforest	27%
Sitka Spruce	17%
Mixed Conifer	12%
Shore Pine	2%

Channel Type Phases:

☐ HC2s - SHRUB PHASE consists primarily of brush vegetation.

MANAGEMENT CONSIDERATIONS

Hydrologic Function: HC2 channels are sediment transport systems. Sediment is delivered from steep mountain headwaters. Since HC2 channels are situated on alluvial/colluvial footslopes, stream bank erosion can introduce significant sediment loads to these channels. However, most sediment is rapidly transported downstream. Some retention of fine sediment occurs in small pools behind woody debris jams.

Aquatic Habitat Capability

Large Woody Debris .....4200 ft^3/1000 linear ft
Available Spawning Area (ASA).....Avg = 3% for 12 sites
Available Rearing Area (ARA).....Avg = 6% for 12 sites

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	LOW
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	MOD	MOD
Steelhead	NEG	NEG

Due to high streamflow velocities, HC2 channels are only occasionally accessible to anadromous species. Lower reaches near the confluence with accessible valley channels have the best fish habitat potential. HC2 channels have marginal spawning potential and limited rearing capability. Overwintering capability is insignificant. They are used primarily by Dolly Varden char. However, due to their location in sediment/water source areas of watersheds, they typically affect downstream fish habitat productivity.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	MOD
Sediment Retention	LOW
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	LOW
Flood Plain Protection	N/A
Culvert Fish Passage	LOW

The HC2 channel has relatively high woody debris loading. Maintenance of this large woody debris source is important in that the wood traps bedload sediment and forms pool habitat for resident fish (BMP 12.6).

Shallow channel incision and sideslope angle contribute to high channel sideslope stability. However, unconsolidated alluvial bank material along some channel segments makes the streams moderately susceptible to bank erosion and lateral channel migration (BMPs 13.16, 13.9, 14.17).

Fish passage through road culverts located near the confluence of HC2 channels with lower gradient channels can be a concern (BMP 14.7).

These are classified as Value Class II or III streams. A minimum 100 foot timber harvest buffer is occasionally required where significant resident fish populations occur (Tongass Timber Reform Act, 1991).

If stream harvest buffers are not required (Class III channels), harvest unit design should account for water quality protection requirements for these streams (BMPs 13.2, 13.3).

Riparian Management Opportunities:

Sport Fish Potential..... N/A
Enhancement Opportunities ..... Large Wood Placement

Stream segments which are tributary to low gradient flood plain channels can provide opportunities for large wood placement to create pool habitat for resident or anadromous fish, particularly Dolly Varden char, cutthroat, and steelhead trout.

DEEPLY INCISED UPPER VALLEY CHANNEL
Channel Mapping Symbol: HC3 (Formerly A2)

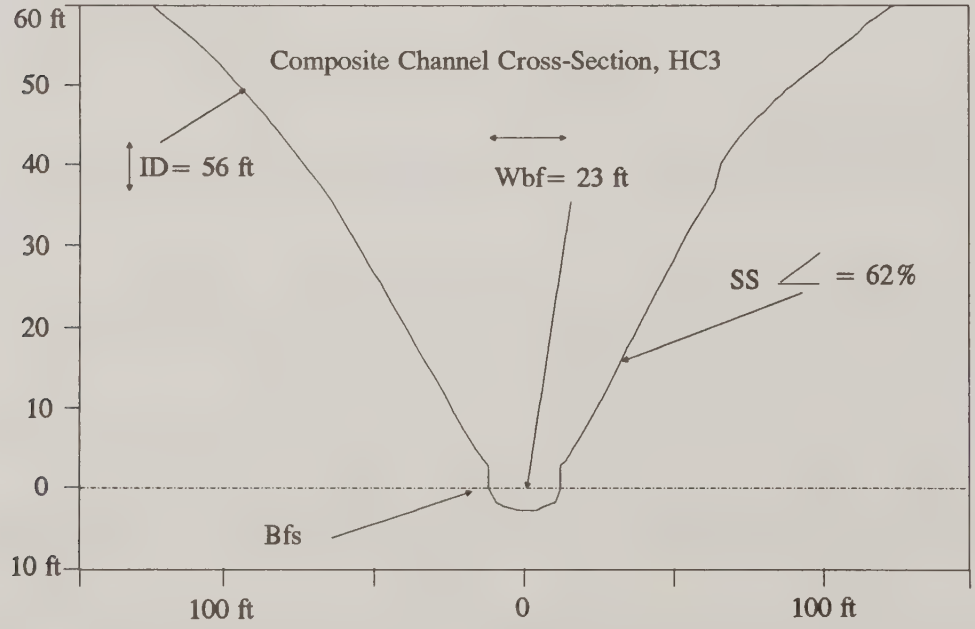
PHYSICAL CHARACTERISTICS

Geographic Setting: The HC3 channels are found in steep sided, narrow, V-shaped valleys. Adjacent landforms are usually snow avalanche slopes or mountainslopes. HC3 channel types are typically upper valley tributaries. Valley sideslopes often extend immediately to the stream's edge, but can be separated by short, steep, upper bank sideslopes. Flow containment is excellent, due to the deep incision and close proximity of valley sideslopes. Cascades, low vertical falls, and bedrock knickpoints are common features.

The HC3 streams can also be found in association with broken hilly or rolling terrain. In these situations, the stream is straight, moderate to deeply incised, and directly controlled by steep hillslopes or bedrock fault lines.

Similar Channel Types: HC5, HC6

Channel Structure



Stream Gradient: .....6-15%, mean = 10%
Incision Depth: .....<50 m (165 ft), mean = 17 m (56 ft)
Bankfull Width:.....Variable, mean = 7 m (23ft)
Dominant Substrate: .....Small cobble to bedrock
Stream Bank Composition: .....Bedrock and cobble
Sideslope Length: .....Mean = 21 m (69 ft)
Sideslope Angle: .....Mean = 62% (32 degrees)
Channel Pattern:.....Single, linear
Drainage Basin Area:.....2.6-13 km^2 (1-5mi^2)

INCHANNEL PHOTO: HC3

Riparian Vegetation: The riparian plant communities are dominantly western hemlock series, and nonforested salmonberry and Sitka alder shrub communities.

Plant Association Series	% Cover
Western Hemlock	46%
Nonforest	16%
Sitka Spruce	13%
Western Hemlock-Alaska Cedar	12%
Western Hemlock-Red Cedar	5%
Mixed Conifer	4%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: HC3 channels are sediment transport systems. Steep mountainslopes may contribute significant amounts of sediment from mass wasting. Steep channel gradients and high stream power limit sediment storage, therefore, sediment is rapidly delivered to downstream channels. Stream flow responds quickly to intense rainfall events.

Aquatic Habitat Capability

Large Woody Debris .....2100 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	LOW	LOW
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	LOW	MOD
Steelhead	NEG	NEG

Due to high stream flow velocity, HC3 channels are generally not accessible to anadromous species. These channels contain very little spawning habitat for anadromous fish species, and, where accessible, minimal rearing habitat. Resident Dolly Varden char inhabit these streams to some extent. HC3 channels typically affect downstream anadromous fish habitat through transport of sediment, large woody debris, nutrients, and aquatic insects.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	MOD
Sediment Retention	LOW
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	MOD TO HIGH
Flood Plain Protection Need	N/A
Culvert Fish Passage	LOW

Maintenance of inchannel large woody debris to trap sediments is a moderate riparian management concern (BMP 12.6).

These channels have moderate stream bank sensitivity, due to reaches with unconsolidated alluvium. Measures to protect stream bank sensitivity should be incorporated into riparian timber harvest prescriptions (BMPs 13.16, 13.9).

Steep sideslopes are also frequently associated with the more deeply incised channel segments, therefore, road construction and timber yarding activities on these channels may pose a risk for mass erosion (BMPs 13.5, 13.9, 13.16, 14.2, 14.3, 14.7-14.9).

High sediment bed loads and debris loads transported by these streams present a significant risk to stream crossing structures and downstream fish habitat (BMPs 14.7, 14.20).

These are classified as Value Class II or III streams. A minimum 100 foot timber harvest buffer is occasionally required where significant resident fish populations occur (Tongass Timber Reform Act, 1991).

If stream harvest buffers are not required (Class III channels), harvest unit design should account for water quality protection requirements for these streams (BMPs 13.2, 13.3).

Riparian Management Opportunities:

Sport Fish Potential.....Low
Enhancement Opportunities .....Large Wood Placement

Placement of large wood structures can provide pools for Dolly Varden rearing, and increase ASA.

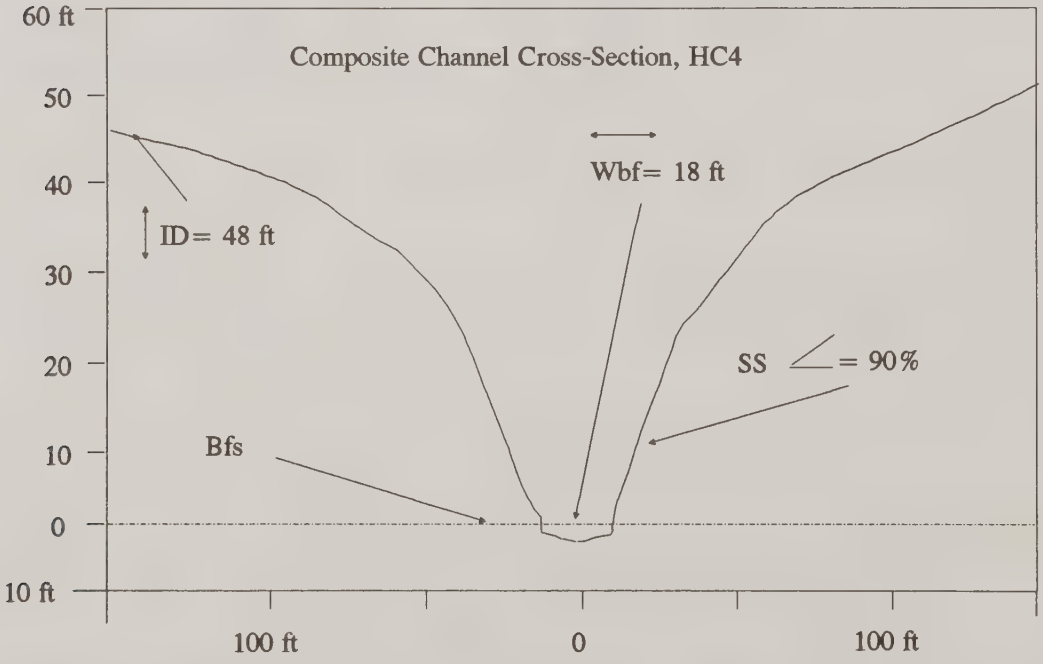
DEEPLY INCISED MUSKEG CHANNEL
Channel Mapping Symbol: HC4 (Formerly A5)

PHYSICAL CHARACTERISTICS

Geographic Setting: HC4 streams are restricted to hill, lowland, and, occasionally, broken mountainslope landforms. These channels are generally situated along wide valley footslopes or lowlands with undulating terrain dominated by muskegs. HC4 streams may also occur on muskeg plateaus and benchlands. Overall regional landscape slope is less than 60 percent. The HC4 channel type consists of steep, linear streams, deeply incised into hill and lowland muskeg landscapes. Deeply incised HC6 channels draining steep mountainslopes often change into HC4 channel types upon entering sloping, lowland landforms. Flow containment is excellent, due to bedrock control and long, steep sideslopes (6-20 m [20-66 ft]).

Similar Channel Types: HC3, HC6

Channel Structure



Stream Gradient: .....>6%, mean = 9%
Incision Depth: .....6-20 m (20-66 ft), mean = 14.5 m (48 ft)
Bankfull Width:.....4-15 m (13-50 ft), mean = 5.4 m (18 ft)
Dominant Substrate: .....Small cobble to bedrock
Stream Bank Composition: .....Bedrock
Sideslope Length: .....6-20 m (20-66 ft), mean = 8.3 m (27.5 ft)
Sideslope Angle: .....Mean = 90% (42 degrees)
Channel Pattern:.....Single, linear
Drainage Basin Area:.....<2.6 km^2 (<1 mi^2)

INCHANNEL PHOTO: HC4

Riparian Vegetation: The riparian plant communities are dominantly mixed conifer series. Other common riparian plant communities include shore pine, nonforested, and western hemlock/blueberry series.

Plant Association Series	% Cover
Mixed Conifer	40%
Shore Pine	15%
Nonforest	12%
Western Hemlock	10%
Western Hemlock-Red Cedar	10%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: HC4 channels function as rapid sediment transport systems. Mass wasting and hillslope processes occurring in headwater areas produce the sediment and debris that is quickly transported downstream. These are high energy channels that are often scoured to bedrock. Stream flow responses to intense rainfall or rain on snow events are usually rapid.

Aquatic Habitat Capability

Large Woody Debris	Insufficient data
Available Spawning Area (ASA)	Insufficient data
Available Rearing Area (ARA)	Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	LOW	MOD
Steelhead	NEG	NEG

Fish access to HC4 channels is limited due to high stream flow velocities and numerous barriers. These channels may get occasional use by anadromous species at their confluence with accessible channels. Limited spawning and rearing areas are used primarily by resident Dolly Varden. The general lack of overwintering habitat limits the rearing potential in HC4 channels. Due to their location at source areas within watersheds, these channels can affect downstream anadromous fish habitat through their transport of sediment, large woody debris, nutrients, and aquatic insects.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	LOW
Sediment Retention	LOW
Stream Bank Sensitivity	LOW
Sideslope Sensitivity	MOD
Flood Plain Protection Need	N/A
Culvert Fish Passage	LOW

Sideslope erosion is likely to be a concern along some HC4 channel segments where weathered bedrock or unconsolidated glacial or volcanic parent materials are found on steep sideslopes. Mass wasting of shallow, somewhat poorly drained soils, contributes to relatively high woody debris loading in HC4 channels. Timber yarding and road construction activity can affect sideslope stability and impact downstream water quality if BMPs are not followed (BMPs 13.5, 13.9, 13.16, 14.2, 14.3, 14.7, 14.17).

High bed load and debris loads carried by these streams present a risk to stream crossing structures (BMPs 14.17, 14.20).

These are classified as Value Class II or III streams. A minimum 100 foot timber harvest buffer is occasionally required where significant resident fish populations occur (Tongass Timber Reform Act, 1991). If stream harvest buffers are not required (Class III channels), harvest unit design should account for water quality protection requirements for these streams (BMPs 13.2, 13.3).

Riparian Management Opportunities:

Sport Fish Potential	LOW
Enhancement Opportunities	N/A

High Gradient Contained Process Group

SHALLOWLY INCISED VERY HIGH GRADIENT CHANNEL

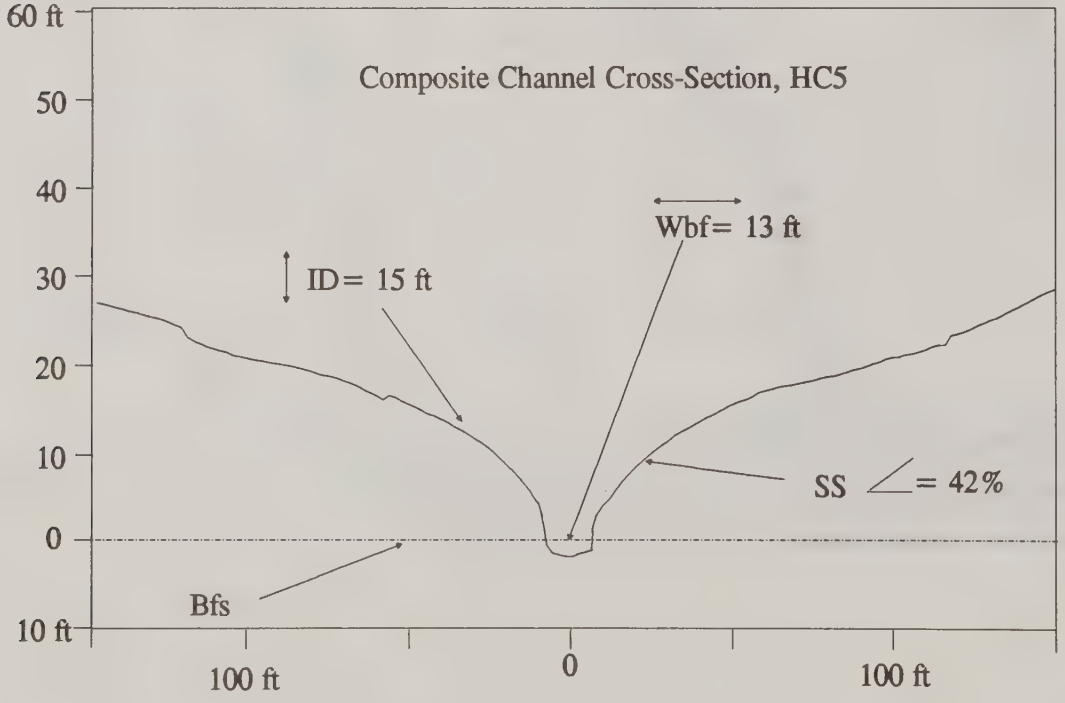
Channel Mapping Symbol: HC5 (Formerly A4)

PHYSICAL CHARACTERISTICS

Geographic Setting: HC5 streams occur in upper headwater regions of glacially scoured valleys. They are generally found in alpine, snow avalanche, and subalpine mountain landforms. The HC5 stream is occasionally found on hilly and sloping lowland landforms. They are most often an outlet channel to alpine lakes, cirque basins, or hanging valleys. They can extend from the cirque basin through high relief alpine or subalpine sideslopes directly to the main valley floor. The HC5 channel types are shallow to moderately incised, very high gradient, mountainslope streams. Channel gradient is highly variable in this channel type, due to the frequent occurrence of falls and cascades. Channel pattern is linear and single, with bedrock control predominating.

Similar Channel Types: HC5 streams are usually tributary to HC4, AF2, MM2 or MC1 streams. In very recently deglaciated, steep sided valleys, HC5 streams can be direct tributaries to main trunk flood plain channels.

Channel Structure



INCHANNEL PHOTO: HC5

Stream Gradient: .....> or = 15%, mean = 28%
Incision Depth: .....< 10 m (<33 ft), mean = 4.5 m (15 ft)
Bankfull Width: .....Variable, mean = 4 m (13 ft)
Dominant Substrate: .....Large rubble to bedrock
Stream Bank Composition: .....Bedrock
Sideslope Length: .....< 10 m (<33 ft), mean = 7.5 m (25 ft)
Sideslope Angle: .....Mean = 42% (23 degrees)
Channel Pattern:.....Single, linear
Drainage Basin Area:..... $< 2.6\ km^2$ ($< 1\ mi^2$)

Riparian Vegetation: The riparian plant communities are variable with western hemlock series, Sitka spruce series, and mixed conifer series being the most dominant. Nonforested species are also quite common, representing 16 percent of the riparian vegetation cover.

Plant Association Series	**% Cover**
Western Hemlock	26%
Sitka Spruce	21%
Mixed Conifer	18%
Nonforest	16%
Western Hemlock-Alaska Cedar	7%
Mountain Hemlock	6%
Western Hemlock-Red Cedar	6%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: HC5 channels function as sediment transport systems. Surface erosion and hillslope mass wasting are the principal sources of stream sediment load. Stream flow responds quickly to intense rainfall and rain on snow events.

Aquatic Habitat Capability

Large Woody Debris .....2700 ft^3/1000 linear ft
Available Spawning Area (ASA).....NEG
Available Rearing Area (ARA).....NEG

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	NEG	NEG
Steelhead	NEG	NEG

Fish access to these channels is prevented by high velocity stream flows and barriers. No significant fish habitat occurs within these channels. However, if resident fish populations (e.g. grayling or rainbow trout) are present in the associated alpine lakes, the confluence of the stream and lake may be used for spawning. Typically, HC5 channels affect downstream anadromous fish habitat through transport of sediment, large woody debris, nutrients, and aquatic insects.

Riparian Management Considerations

Concern for Management of:
Large Woody Debris .....LOW
Sediment Retention .....LOW
Stream Bank Sensitivity.....LOW
Sideslope Sensitivity.....MOD
Flood Plain Protection.....N/A
Culvert Fish Passage.....N/A

The significant amount of bedrock influence makes HC5 channels fairly stable. However, the unstable shallow soils on steep channel sideslopes present a high risk for mass erosion when disturbed by road construction or timber harvesting (BMPs 13.5, 14.2, 14.3).

These are classified as Value Class III streams. Timber harvest unit design should incorporate water quality protection needs for these streams (BMPs 13.2, 13.3).

Riparian Management Opportunities:

Sport Fish Potential.....LOW
Enhancement Opportunities .....N/A

LANDSCAPE PHOTO: HC5

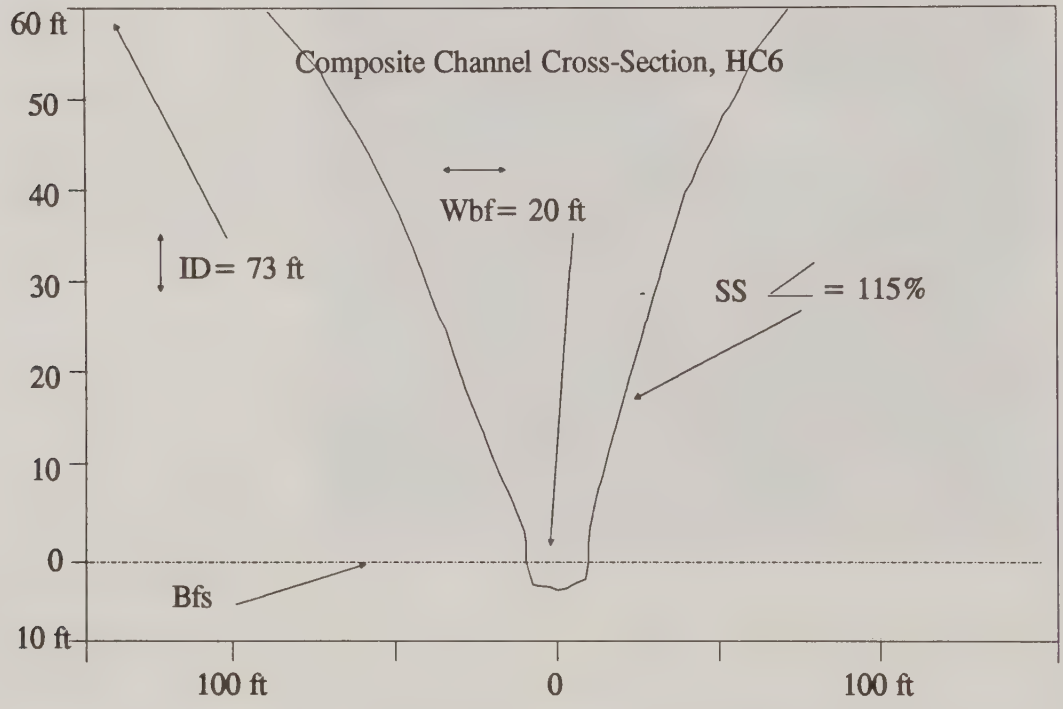
DEEPLY INCISED MOUNTAINSLOPE CHANNEL
Channel Mapping Symbol: HC6 (Formerly A1)

PHYSICAL CHARACTERISTICS

Geographic Setting: HC6 channels are most commonly found on mountainslope or hill landforms. They occur in large ravines, with a consistent sideslope length greater than 10 meters (33 feet). They usually initiate as first order streams and commonly extend to ridgetops and summits. HC6 channels can extend from the alpine zone to the footslope or valley floor landforms. Snow avalanche chutes may be associated with HC6 streams. On steep mountainslopes along inlets and straits, channels flow directly into saltwater.

Similar Channel Types: HC3, HC4, HC5

Channel Structure



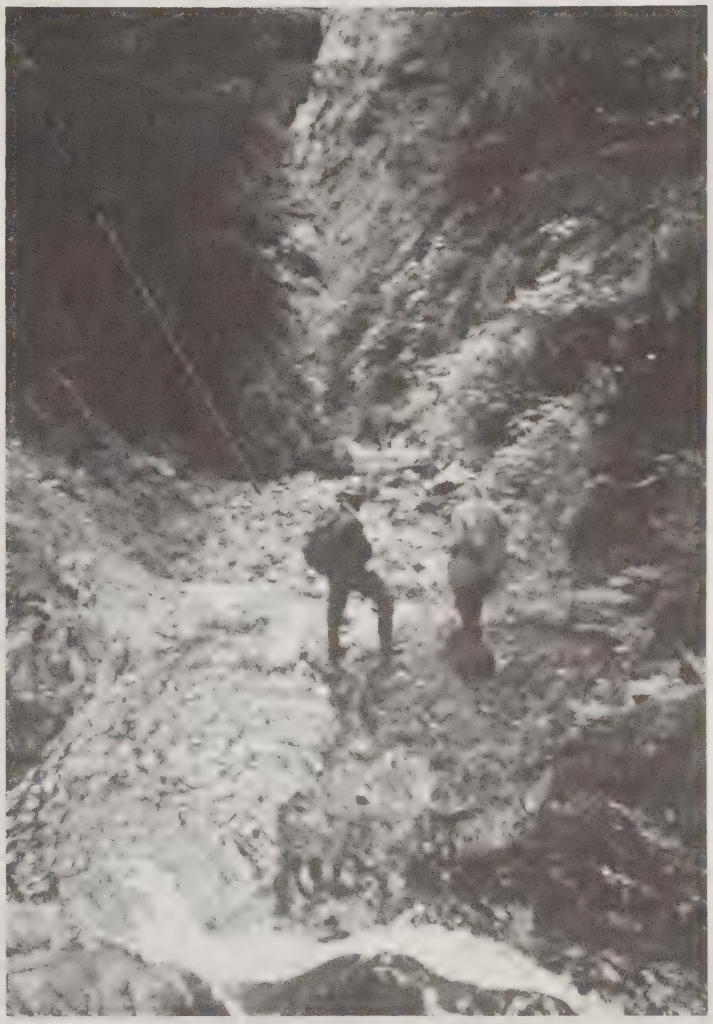
Channel Gradient:.....>15%, mean = 27%
Incision Depth: .....Mean = 22 m (73 ft)
Bankfull Channel Width:.....< or = 15 m (50 ft), mean = 6 m (20 ft)
Dominant Substrate: .....Bedrock, boulders, and cobble
Stream Bank Composition: .....Bedrock
Sideslope Length: .....>10 m (>33 ft), mean = 15 m (50 ft)
Sideslope Angle: .....>100%, mean = 115% (49 degrees)
Channel Pattern:.....Single, linear
Drainage Basin Area:.....<2.6 km^2 (<1 mi^2)

Riparian Vegetation: The riparian plant communities are dominated by the western hemlock series. Nonforested communities, which occur on disturbed channel sideslopes, are also common.

Plant Association Series	% Cover
Western Hemlock	41%
Nonforest	15%
Western Hemlock-Alaska Cedar	12%
Mixed Conifer	12%
Sitka Spruce	11%
Western Hemlock-Red Cedar	7%

Channel Type Phases: N/A

INCHANNEL PHOTO: HC6



MANAGEMENT CONSIDERATIONS

Hydrologic Function: HC6 channels are primarily sediment transport systems. Channel sideslopes are often highly unstable, with a high sediment input potential. Landslides entering the channel may result in debris torrents that scour a significant length of stream. Steep channel gradients rapidly deliver sediment to downstream reaches. Stream flow responds quickly to intense rainfall events. Short term entrapment of minor volumes of sediment is provided by woody debris. These deposits rapidly become mobile during high flow events.

Aquatic Habitat Capability

Large Woody Debris .....4500 ft^3/1000 linear ft
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	NEG	NEG
Steelhead	NEG	NEG

HC6 channels are generally not accessible to anadromous or resident fish species because of high stream gradient, high flow velocity, seasonally low water, and migration barriers. These channels contain negligible spawning or rearing habitat.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris ..... MOD
Fine Sediment Retention ..... LOW
Stream Bank Sensitivity ..... MOD
Sideslope Sensitivity ..... HIGH
Flood Plain Protection ..... N/A
Culvert/Fish Passage ..... LOW

Large woody debris is a relatively important factor controlling the routing of sediment through HC6 channels. Considerable inchannel storage of sediment occurs behind log steps and small debris jams, however, retention of fine sediment is low due to high stream flow energy. Woody debris recruitment mitigation measures may be necessary on a site specific basis. Excessive amounts of large woody debris in these channels can be a factor in the initiation of destructive debris torrents (BMP 12.6).

Sideslope sensitivity and erosion potential are high in HC6 channels due to over steepened slopes (BMPs 13.5, 13.9, 13.16, 14.2, 14.3, 14.7-14.9, 14.17). Stream bank and sideslope disturbance associated with road cuts and timber yarding may result in mass wasting and significant sediment delivery to downstream channels.

High bed load sediment and debris loads carried in these streams can pose a high risk to stream crossing structures and downstream fish habitat (BMPs 14.17, 14.20).

These are classified as Value Class III streams. Timber harvest unit design should incorporate water quality protection needs for these streams (BMPs 13.2, 13.3).

Riparian Management Opportunities:

Sport Fish Potential ..... N/A
Enhancement Opportunities ..... N/A

LANDSCAPE PHOTO: HC6

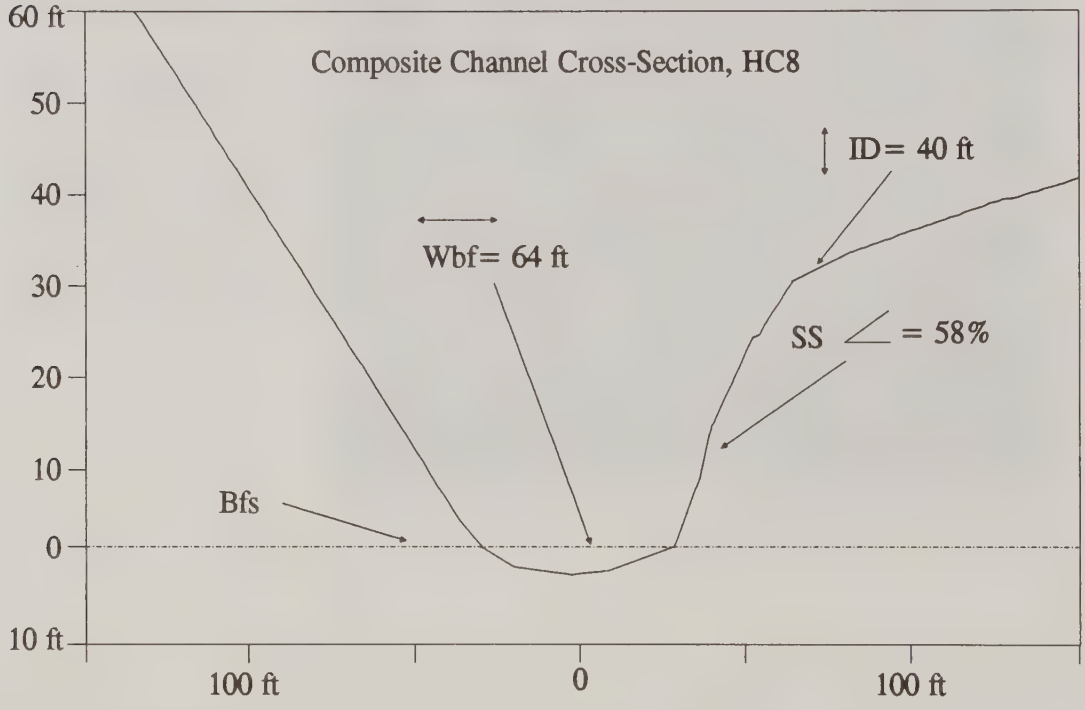
MODERATE/HIGH GRADIENT GLACIAL CASCADE CHANNEL
Channel Mapping Symbol: HC8 (Formerly D7)

PHYSICAL CHARACTERISTICS

Geographic Setting: The HC8 channel is usually situated in a constricted valley bottom, with steep mountain or hillslope landforms immediately adjacent. These channels drain small valley glaciers.

Similar Channel Types: HC3, MC3, HC9

Channel Structure



Stream Gradient: .....3-10%, mean = 7%
Incision Depth: .....> 10 m (33 ft), mean = 12 m (40 ft)
Bankfull Width:.....15-30 m (50-99 ft), mean = 19 m (64 ft)
Dominant Substrate: .....Large cobble to bedrock
Stream Bank Composition: .....Bedrock
Sideslope Length: .....Highly variable
Sideslope Angle: .....Variable, mean = 58% (30 degrees)
Channel Pattern:.....Linear, single channel
Drainage Basin Area:.....< 13 km^2 (<5 mi^2)

Riparian Vegetation: The riparian plant communities are dominated by the nonforested salmonberry, willow, and Sitka alder shrub communities.

Channel Type Phases: N/A

INCHANNEL PHOTO: HC8

MANAGEMENT CONSIDERATIONS

Hydrologic Function: Rapid sediment transport is typical of HC8 channels. Steep channel gradient, large diameter substrate, and well contained flows result in high stream power. A high glacial silt load is characteristic since glacial channels normally precede the HC8 in the watershed network. Sediment inputs from slope failures are moderately frequent. Bank stability is high due to bedrock composition, and inchannel sediment storage is minimal.

Aquatic Habitat Capability

Large Woody Debris .....N/A
Available Spawning Area (ASA).....N/A
Available Rearing Area (ARA).....N/A

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	NEG	NEG
Steelhead	NEG	NEG

These channels have restricted accessibility to anadromous species due to within segment and downstream barriers. They may get some use in lower gradient, downstream reaches by spawning chinook salmon, chum salmon, or Dolly Varden char which frequent associated glacial GO4 or GO2 channels. Spawning success is highly unlikely due to high velocities and high bedload movement. Rearing capability is also insignificant.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris ..... LOW
Sediment Retention ..... LOW
Stream Bank Sensitivity ..... LOW
Sideslope Sensitivity ..... MOD
Flood Plain Protection ..... N/A
Culvert Fish Passage ..... LOW

Sideslope sensitivity is the primary management concern associated with HC8 channel types. Steep sideslopes with shallow soils are sensitive to disturbance. Road construction can initiate sideslope mass wasting and deliver large quantities of sediment to the HC8 channels (BMPs 14.2, 14.3).

Stream crossings are generally not feasible, however, when they are, high bedload transport poses a significant risk to stream crossing structures (BMPs 14.17, 14.20).

These are typically classified as Value Class III streams.

Riparian Management Opportunities:

Sport Fish Potential ..... N/A
Enhancement Opportunities ..... N/A

LANDSCAPE PHOTO: HC8

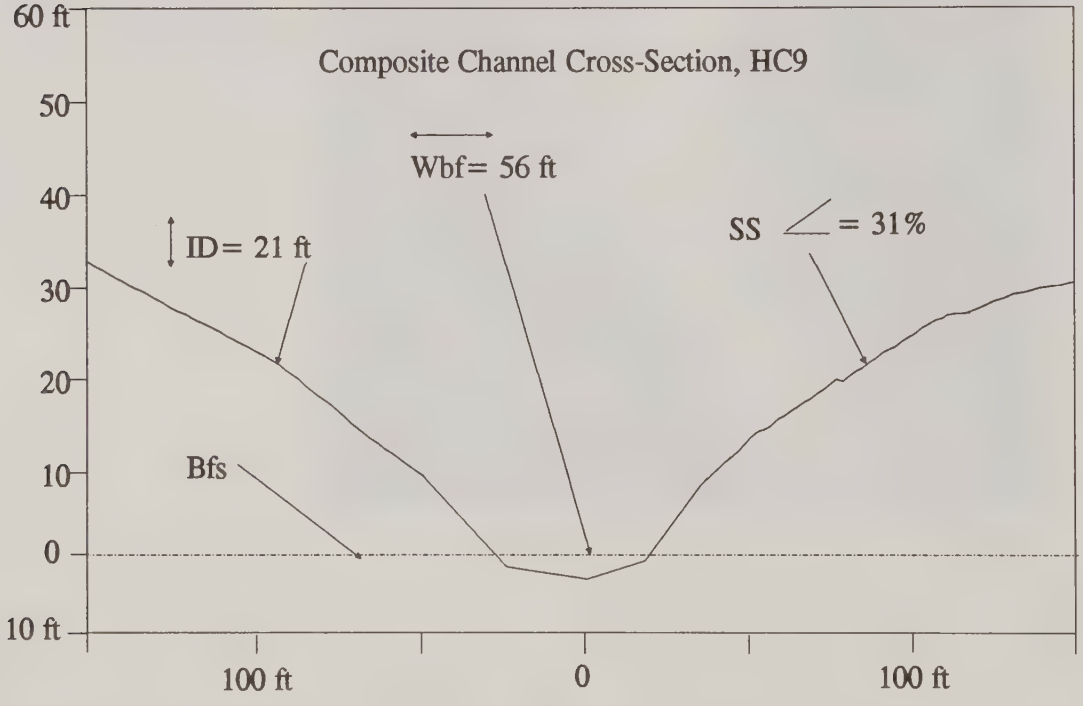
HIGH GRADIENT INCISED GLACIAL TORRENT CHANNEL
Channel Mapping Symbol: HC9 (Formerly D2)

PHYSICAL CHARACTERISTICS

Geographic Setting: The HC9 channel type occurs in upper watershed areas or on mountainslopes. The HC9 channel is a very high gradient channel emanating from the terminus of a steep valley glacier or perched alpine glacier. A high silt and sediment load is characteristic, and stream power is also quite high.

Similar Channel Types: HC8, HC6

Channel Structure



Stream Gradient: .....>6%, mean = 19%
Incision Depth: .....Variable, <15 m (50 ft), mean = 6.5 m (21 ft)
Bankfull Width:.....Mean = 17 m (56 ft)
Dominant Substrate: .....Large cobble to bedrock
Stream Bank Composition: .....Bedrock
Sideslope Length: .....<20 m (>66ft), mean = 18 m (58 ft)
Sideslope Angle: .....Mean = 31% (17 degrees)
Channel Pattern:.....Single, linear channel
Drainage Basin Area:.....<13 km^2 (<5 mi^2)

INCHANNEL PHOTO: HC9

Riparian Vegetation: The riparian plant communities are dominated by nonforested Sitka alder and willow shrub communities. The mountain hemlock series is also significant.

Plant Association Series	% Cover
Nonforest	62%
Mountain Hemlock	24%
Sitka Spruce-Cottonwood	8%
Western Hemlock	3%

Channel Type Phases: N/A

MANAGEMENT CONSIDERATIONS

Hydrologic Function: HC9 channels function as sediment transport systems. High channel gradient, large size substrate material, and well contained flows result in high stream power. Stream flows are largely derived from snow and glacier melt, and carry a high glacial silt load. Peak flows occur during the spring/summer melt season and again in the heavy rainfall season.

Aquatic Habitat Capability

Large Woody Debris .....Insufficient data
Available Spawning Area (ASA).....Insufficient data
Available Rearing Area (ARA).....Insufficient data

Indicator Species Ratings

MIS	ASA	ARA
Coho	NEG	NEG
Pink	NEG	NEG
Chum	NEG	NEG
Sockeye	NEG	NEG
Chinook	NEG	NEG
Dolly Varden	NEG	NEG
Steelhead	NEG	NEG

These channels are almost entirely inaccessible to anadromous and resident species due to high streamflow velocities and the presence of numerous local and downstream barriers.

Riparian Management Considerations

Concern for Management of:

Large Woody Debris	LOW
Sediment Retention	LOW
Stream Bank Sensitivity	MOD
Sideslope Sensitivity	MOD
Flood Plain Protection Need	N/A
Culvert Fish Passage	N/A

Stream bank and sideslope sensitivity are moderate for HC9 stream segments. Sideslope mass wasting of glacial till or shallow soils can contribute to sediment loads in HC9 channels, however, sediment contributions from glacial meltwater tend to greatly overshadow inchannel sediment sources.

High bedload sediment transport poses a significant risk to stream crossing structures (BMPs 14.17, 14.20).

These are classified as Value Class III streams.

Riparian Management Opportunities:

Sport Fish Potential	N/A
Enhancement Opportunities	N/A

High Gradient Contained Process Group

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Anadromous Species: Species of fish, particularly Pacific salmon, trout and char, that ascend rivers and streams to breed.

Alluvial Cone: The material washed down mountain and hill slopes by ephemeral streams and deposited at the mouth of gorges or V-notch ravines in the form of a steep conical mass descending equally in all directions from the point of issue. (Fairbridge 1968)

Alluvial Fan: A body of alluvium, with or without debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley (or V-notch) onto a plain. (Hawley and Parsons, 1980)

Alluvium: Unconsolidated clastic material, including gravel, sand, silt, and clay, deposited by running water.

Aquatic Habitat Capability: Synopsis of the ability of a channel type to support anadromous fish species (provide spawning and rearing habitat).

ARA (Available Rearing Area - habitat): The place or site in a stream where fish live during their growth period.

ASA (Available Spawning Area - habitat): The place or site in a stream where fish breed and eggs are incubated. Available refers to making the assessment of spawning area during a particular stream flow stage.

Backwater: A pool type formed by an eddy along channel margins from obstructions such as bars, root wads, and boulders, or resulting from back-flooding upstream from an obstructional blockage. The backwater is sometimes separated from the channel by sand/gravel bars. (AFS 1985)

Bankfull Depth: The mean water depth which occurs during a bankfull stream flow event.

Bankfull Width: The mean water width which occurs during a bankfull stream flow event.

Barrier: A vertical falls, steep cascade, or high velocity chute in a stream channel that prevents migration of anadromous species.

Bedrock Control: A section of a stream channel that is composed of bedrock material. Stream bed and banks consist of the underlying bedrock.

Bed Scour: The erosion of the channel bed substrate.

Boulders: Large stream bed material, 25.4 centimeters to .914 meters (10 inches to 3 feet) in diameter.

Cascade: A stream flow condition and habitat type characterized by swift current, exposed rock and boulders, high gradient, considerable turbulence and surface agitation, and consisting of a stepped series of drops. (AFS 1985)

Channel: A natural waterway of perceptible extent that periodically or continuously contains moving water. It has a definite bed and banks which serve to confine the water. (AFS 1985)

Aggrading channels: Stream channels that are subject to higher than normal sediment loads (sediment loads exceed the carrying capacity of the stream). These channels are experiencing long term increase in sediment load.

Degrading channels: Stream channels that are experiencing a long term decrease in sediment load and/or an increase in flow volume and velocity. Bed scour and loss of sediment deposits are characteristic.

Channel Gradient: The angle between the water surface and the horizontal plane, expressed in percent.

Channel Pattern: The configuration in plan-view of a stream channel. Patterns used in Region 10 are braided, multiple, and straight.

Channel Sideslope: Refers to the lower and upper banks of the stream channel. The sideslope differs from the stream bottom in material composition and gradient. Normally the sideslope is the first significant slope break from the wetted stream bottom, in the cross sectional profile of the channel.

Channel Stability: The sensitivity of a channel area to disruptions in its physical structure. Under undisturbed conditions, natural channels demonstrate wide variability in withstanding physical disruptions without experiencing changes in their ability to pass streamflow, process sediment, or provide habitat. Stable channels are capable of withstanding an appreciable amount of disruption with little effect on function. In contrast, unstable channels are ones which respond readily to significant disruptions.

Channel Type: Stream segments which have fairly consistent physical characteristics.

Cirque: A semicircular form found in glaciated mountains. Described as an armchair hollow possessing three elements - a steep, nearly vertical headwall, a concave floor meeting the headwall in a sharp slope break, and a lip or threshold at the entrance which may be bedrock, glacial moraine, or both. (Fairbridge 1968)

Cobble (rubble): Stream bed material ranging in size from 6.1-25.4 centimeters (2.4-10 inches) in diameter.

Coho Spawning and Rearing Capability: The capacity of habitat in a stream to support the breeding (spawning) of adult coho salmon, incubation of their eggs, and the growth (rearing) of immature coho salmon.

Containment: Refers to the degree of rigidity of the stream channel's banks. A bedrock channel is well contained due to the high erosion resistance of its banks. A glacial channel is normally poorly contained as its banks consist of alluvial material that is easily eroded by the stream flow.

Debris Torrent: Mass erosion process which occurs when a debris avalanche enters a high gradient stream channel, mixes with water, and continues downstream as a slurry of mud, large woody debris, and water. Debris torrents often scour the channel through which they pass, then deposit debris and sediment on the footslope or valley floor.

Downcutting: Fluvial process by which stream flow scours bed material, thereby lowering channel.

Estuarine (area): The environmental system of an estuary and those transitional areas which are consistently influenced or affected by water from an estuary. (Schwarz et.al., 1976)

Estuary: All or part of the mouth of a river or stream having an open, natural connection with the sea and within which sea water is measurably diluted by freshwater runoff (the tide meets with river currents or flows). (Schwarz et.al., 1976)

Fines (fine sized bed material): Bed material less than 4 mm (0.16 in) in diameter.

Fish Passage Hazard: This refers to the potential for creating conditions with bridges or culverts that would prevent adult or juvenile anadromous fish from moving into areas where they breed or into sites that are necessary for their growth or survival.

Flood Plain: That portion of a stream valley adjacent to the channel which is built by sediments of the stream and which is covered with water when the stream overflows its banks at flood stage. Also, the nearly level land situated on either side of a channel which is subject to overflow flooding. (Schwarz et.al., 1976)

Flow Containment: The ability of a stream channel to contain large stream flow events within the channel area.

Fluvial: Geomorphic processes associated with running water; of or pertaining to rivers.

Footslope: The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope or mountainslope. (Hawley 1980)

Foreland: Broad, low relief plain composed primarily of parallel beach ridges, dune chains, and inwardly curved spits, subject to wave action. (Fairbridge 1968)

Glacial Outwash Plain: A broad, low relief landform formed by glacial deposits consisting of washed bedload materials (gravel and sand). Normally situated in a flat, glacial valley floor preceding a glacier or as a broad, flat foreland cut by braided, glacially fed streams.

Glide: Very low velocity stream flow creating a calm surface condition with water flowing smoothly and gently.

Hillslope: The steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of the hill. A hill is defined as a natural elevation of the land surface rising as much as 300 meters (1000 feet) above the surrounding lowlands. Slopes generally exceed 15 percent. (Hawley 1980)

Hydrologic Function: The capacity of a stream to move or to store bedload material and suspended sediment. Stream gradient, the resultant stream power, and size of material are critical factors. Stream power is the rate of doing work or a measure of the energy available for moving rock, sediment, or woody debris in the stream channel, as determined by discharge, water surface slope, and the specific weight of water. (AFS 1985)

Incision Depth: The vertical distance between the channel bottom at the thalweg and the first significant slope break occurring above the bankfull stage point. Channels adjacent to flood plains typically lack any adjacent sideslope, and, by definition, have low incision depths.

Indicator Species: A species whose presence or absence and abundance are used as indicators of environmental conditions. (AFS 1985)

Knickpoint: Any interruption or break in slope: a point of abrupt inflection in the longitudinal profile of a stream or of its valley. (Hawley 1980)

Landform: Recognizable physical forms of the earth's surface, having characteristic shapes and produced by natural causes. The landforms which typically occur in the Chatham Area have been classified and described in the terrestrial portion of the Integrated Resource Inventory: Descriptive I.D. Legend Handbook (USDA, 1982 and 1985).

Large Woody Debris (LWD): A term used to describe logs, tree boles, rootwads, and limbs that are in, on, or near the stream channel. Current usage of the term defines LWD as woody material greater than 10.2 centimeters (4 inches) in diameter and equal to or greater than 3.05 meters (10 feet) in length. (AFS 1985)

Littoral: The relatively shallow (up to approximately 9.1 meters [30 feet] in depth) area of a lakeshore where sunlight can penetrate.

Lowlands: Usually refers to low elevation and low relief valley bottom landforms.

Median: The middle of a distribution of values such that 50% of the values are higher and 50% are lower.

Meltwater: Runoff flow produced by a melting mountain glacier, valley glacier, or mountain snowfield.

Moraine: A glacial landform created by debris deposits during both growth and recession. The moraine is an accumulation of drift, with an initial topographic expression of its own. It is built chiefly by the direct action of glacial ice. Examples are lateral and terminal moraines, usually composed of glacial till. (Hawley 1980)

Mountainslope: A natural elevation of the land surface, rising more than 300 meters (1000 feet) above surrounding lowlands and generally having a steepness of 25% slope or greater. (Hawley 1980)

Muskeg: A bog, usually sphagnum, frequently with tussocks of deep accumulations of organic material, growing in wet, poorly drained, boreal regions, often areas of permafrost. (Hawley 1980)

Outwash: Stratified detritus (sand and gravel) removed or washed out from a glacier by meltwater streams and deposited in front of or beyond the terminal moraine or the margin of an active glacier. (Hawley 1980)

Overwinter Habitat: The place or site in a stream or lake where young, immature fish can survive during winter.

Palustrine: Pertaining to shallow low velocity backwater sloughs, swamps, bogs, and muskeg ponds and their outlet streams or any ponded environment. Ponded is a condition in which free water covers the soil surface and is removed only by percolation, evaporation, or transpiration. (Hawley 1980)

Peak Flow Magnitude: The relative size of the annual flood event, represented by the estimated bankfull streamflow. Size classes used for describing relative magnitudes are Low (less than 500 cfs), Moderate (500 - 1000 cfs), High (1000 - 1750 cfs), and Very High (greater than 1750 cfs). (cfs = cubic feet per second and is used to quantify the discharge from a stream or river.)

Periglacial: The processes, conditions, areas, climates, and topographic features at the immediate margins of former and existing glaciers and ice sheets, influenced by the cold temperature of the ice. (Hawley 1980)

Pink Spawning Capability: The capacity of habitat in a stream to support the breeding (spawning) of adult pink salmon and the incubation of their eggs. Unlike coho salmon, pink salmon young migrate directly to the ocean after they hatch.

Placid Flow: A very, low velocity stream flow condition in a natural channel. Usually occurs in a deep, wide, low gradient segment of a stream channel.

Plant Association: A potential natural plant community (climax plants) of definite floristic composition and uniform appearance. (Martin et.al., 1985)

Plant Community: A unit of vegetation that is relatively uniform in structure and floristic composition and consists of competing plants of one or more species in a common location. (Martin et.al., 1985)

Nonforested Community: A plant community of less than 10% crown cover by trees, less than 7.6 meters (25 feet) in height.

Pond: An increase in water surface elevation upstream of a blockage or an obstruction. Ponds are often created by beaver dams. Flow velocity approaches laminar flow conditions.

Rearing Habitat Area: The place or site in a stream where juvenile fish live during their growth period. (AFS 1985)

Resident Spawning and Rearing Capability: The capacity of habitat in a stream to support adult breeding (spawning), incubation of their eggs, and growth (rearing) of resident immature trout or char. (AFS 1985)

Resident Species: Species of fish that live in freshwater streams for their entire life cycle. Used in this field guide to refer to Dolly Varden char, rainbow trout, and cutthroat trout.

Riparian: Pertaining to anything connected with or immediately adjacent to the banks of a stream or other body of water. (AFS 1985)

Riparian Vegetation: Vegetation growing on or near the banks of a stream or body of water on soils that exhibit some wetness characteristics during some portion of the growing season. (AFS 1985)

Rootwad: The root mass of the tree, butt end. (AFS 1985)

Rubble: Stream bed material ranging in size from 6.09-25.4 centimeters (2.4 to 10 inches) in diameter.

Scrub Timber: Vegetation dominated by shrubs. In the Preliminary Classification for Vegetation of Alaska, treeless vegetation (or with less than 10% tree crown cover) and with shrubs comprising 25% or more of the absolute crown cover. (Gabriel and Talbot, 1984)

Secondary Channel (side channel): Lateral channel with an axis of flow parallel to the mainstem and fed by the main stem. (AFS 1985)

Sediment: Fragmented material that originates from weathering of rocks and decomposition of organic material that is transported by, suspended in, and eventually deposited in the stream bed. (AFS 1985)

Sediment deposition: The process of sediment precipitating out of suspension in the water column. Heavier particles will drop out first, then the lighter particles. Normally, lower gradient reaches will be the zones of deposition as flow velocities are less, allowing for precipitation of particles to occur.

Sediment routing: Describes the entire process of transporting the sediment from the source area to the final zone of deposit (i.e estuary). Particles are routed through the stream network of a watershed. A normal progression would be from the steep mountainslope channels, where mass wasting is common, through the moderate gradient transport channels, and finally to the low gradient, alluvial or estuary channels.

Sediment storage: A stream will accumulate sediment in zones of low velocity, low gradient until high flow events occur to mobilize the stored deposits of sediment and transport them further down the system.

Sediment transport: The movement of sediment through the stream, from the source area to a point of deposition.

Sideslope: The slope which occurs directly adjacent to, and connected with, the channel lower bank. Upper banks, if present, will compose part, but not necessarily all, of this slope.

Slough: Normally a side channel to a mainstem channel, with low velocity stream flow. Occurs in a flood plain, delta, or glacial outwash plain. (Fairbridge 1968)

Spawning Habitat Area: The place or site in a stream where fish breed and eggs are incubated before hatching. (AFS 1985)

Sport Fish: Fish, shellfish, or other fishery resources taken for personal use, subject to regulations, and not for sale or barter.

Stream: A natural water course containing flowing water, at least part of the year, supporting a community of plants and animals within the stream channel and the riparian vegetation zone. (AFS 1985)

Stream Adjacent Roads: Roads, either temporary or permanent, which occur upon the channel's adjacent sideslope.

Stream Bed: The substrate plane bounded by the stream banks, over which the water column moves. Also called stream bottom. (AFS 1985)

Stream Bank: The portion of the channel cross section that restricts lateral movement of water at normal water levels. The bank often has a gradient steeper than 45 degrees and exhibits a distinct break in slope from the stream bottom. An obvious change in substrate may be a reliable delineation of the bank. (AFS 1985)

Lower bank: The periodically submerged portion of the channel cross section from the normal high water line to the water's edge during the summer low flow period.

Upper bank: That portion of the topographic cross section from the break in the general slope of the surrounding land to the normal high water line.

Stream Crossing Site Hazard: The potential for conditions to exist within the active channel which would result in aquatic resource damage if bridges or culverts were constructed without special design considerations and/or mitigation.

Stream Reach: Any specified length of stream or a relatively homogeneous section of stream having a repetitious sequence of physical characteristics and habitat types. (AFS 1985)

Substrate: The mineral and/or organic material that forms the bed of the stream. (AFS 1985)

Torrent (glacial): Flow condition in high gradient stream channels produced by rapid snowmelt or glacial ice melt. Characterized by high stream flow velocity, near bankfull discharge, and standing waves. (AFS 1985)

Tributary Stream Habitat: Those unmapped channels (unclassified according to channel types) which join a larger, unmapped stream channel. In lower gradient landforms, such as flood plains and estuaries, these small channels can have important habitat value and management significance.

Uncontained Stream: Not confined to an entrenched or well defined channel.

Upper Valley: Described as the higher elevation upper third in the longitudinal profile of a valley floor.

Underfit Streams: Streams which have undergone drastic reduction of discharge and which are now too small for the valleys or channels which they occupy. These channels occur in the Situk River basin of the Yakutat Forelands. (Fairbridge 1968)

Upwelling: The rising of cold, heavy, subsurface water toward the surface. (AFS 1985)

Value Class I: Streams with anadromous (fish ascending from oceans to breed in fresh water) or adfluvial (fish ascending from fresh water lakes to breed in streams) lake and stream habitat. Also included is the habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations. (USDA 1985)

Value Class II: Streams with resident fish populations and generally steep (often 6-15 percent) gradient (can also include streams from 0-5 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values. These streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use. (USDA 1985)

Value Class III: Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat. (USDA 1985)

V-notch Ravine: A very steep (greater than 15% gradient), deeply incised stream channel. Usually situated on steep mountainslopes or hillslopes. HC6 and HC4 channel types are commonly described as V-notches.

Wash Load: That part of the sediment load in a stream which, because of its fine size, has such a small settling velocity that it is held in suspension as colloidal particles. It is composed of exceedingly fine particles having vanishingly low rates of settling. (Leopold et.al., 1964)

APPENDIX A:
AQUATIC CAPABILITY RATINGS - MANAGEMENT INDICATOR SPECIES

CHANNEL TYPE		COHO		PINK		CHUM		SOCKEYE		CHINOOK		DOLLY VARDEN		STEELHEAD	
NEW	OLD	ASA	ARA	ASA	ARA	ASA	ARA	ASA	ARA	ASA	ARA	ASA	ARA	ASA	ARA
ESTUARINE PROCESS GROUP															
ES1	E4	N	H	N	N	N	L	N	L	N	N	N	N	N	N
ES2	E3	H	H	H	H	H	L	N	N	N	N	M	M	N	N
ES3	E2	M	L	L	L	L	L	N	N	N	N	M	M	N	N
ES4	E1	H	L	H	H	N	N	N	N	N	N	N	N	N	N
ES8	E5	N	N	N	N	N	N	N	M	N	N	N	N	N	N
PALUSTRINE PROCESS GROUP															
PA1	L1	L	H	N	N	N	N	L	M	N	N	L	H	N	N
PA2	L2	L	H	N	N	N	N	M	M	N	N	L	H	N	N
PA3	L3	L	H	N	N	N	N	M	H	L	M	L	M	N	N
PA4	L4	L	H	N	N	N	N	L	H	N	L	L	L	N	N
PA5	L5	N	H	N	N	N	N	L	H	N	N	N	H	N	N
FLOOD PLAIN PROCESS GROUP															
FP1	C4	L	H	N	N	N	N	L	L	N	N	L	M	N	N
FP2	C6	L	M	N	N	N	N	L	L	N	N	L	M	N	N
FP3	B1	H	H	M	N	M	N	H	N	L	L	H	H	M	H
FP4	C1	H	H	H	N	H	N	H	N	M	M	H	H	H	H
FP5	C3	H	H	H	N	H	N	H	N	H	H	H	H	H	H
GLACIAL OUTWASH PROCESS GROUP															
GO1	D8	M	H	N	N	M	N	M	M	M	M	L	L	N	N
GO2	D4	L	L	N	N	M	N	M	L	M	M	L	H	N	N
GO3	D5	M	M	L	N	M	N	M	M	M	M	L	L	N	N
GO4	D3	L	L	N	N	L	N	L	N	L	L	M	M	N	N
GO5	D1	N	N	N	N	N	N	N	N	N	N	N	N	N	N
ALLUVIAL FAN PROCESS GROUP															
AF1	B5	M	M	M	N	M	N	M	N	N	N	M	M	L	L
AF2	A3	L	L	N	N	N	N	L	N	N	N	L	M	N	N
AF8	D6	N	N	N	N	L	N	L	N	N	N	L	L	N	N
LARGE CONTAINED PROCESS GROUP															
LC1	C2	M	M	M	N	M	N	L	N	N	N	H	H	M	H
LC2	C5	M	M	L	N	L	N	L	N	L	M	H	H	M	M
MODERATE GRADIENT MIXED CONTROL PROCESS GROUP															
MM1	B2	M	M	M	N	M	N	L	N	L	L	H	H	L	L
MM2	B3	M	L	M	N	M	N	L	N	H	L	H	H	H	M
MODERATE GRADIENT CONTAINED PROCESS GROUP															
MC1	B4	L	M	N	N	N	N	N	N	N	N	L	L	N	N
MC2	B6	L	M	L	N	L	N	N	N	N	N	M	M	L	M
MC3	B7	L	L	N	N	N	N	N	N	N	N	L	M	L	L
HIGH GRADIENT CONTAINED PROCESS GROUP															
HC1	A6	N	L	N	N	N	N	N	N	N	N	L	M	N	N
HC2	A7	L	L	N	N	N	N	N	N	N	N	M	M	N	N
HC3	A2	L	L	N	N	N	N	N	N	N	N	L	M	N	N
HC4	A5	N	N	N	N	N	N	N	N	N	N	N	N	N	N
HC5	A4	N	N	N	N	N	N	N	N	N	N	L	M	N	N
HC6	A1	N	N	N	N	N	N	N	N	N	N	N	N	N	N
HC8	D7	N	N	N	N	N	N	N	N	N	N	N	N	N	N
HC9	D2	N	N	N	N	N	N	N	N	N	N	N	N	N	N

- CHANNEL TYPE CODE: NEW=AFTER 9/91, OLD=PRIOR TO 9/91
- ASA=AVAILABLE SPAWNING AREA
- ARA=AVAILABLE REARING AREA
- N=NEGLIGIBLE, L=LOW, M=MODERATE, H=HIGH

APPENDIX B:
RIPARIAN MANAGEMENT CONCERNS

CHANNEL TYPE NEW	CHANNEL TYPE OLD	STREAM CLASS	LARGE WOOD	SEDIMENT RETENTION	STREAM BANK SENSITIVITY	SIDESLOPE SENSITIVITY	FLOOD PLAIN PROTECTION	CULVERT FISH PASSAGE
ESTUARINE PROCESS GROUP								
ES1	E4	I	L	H	M	NA	L	H
ES2	E3	I	L	H	H	NA	M	M
ES3	E2	I	L	M	M	NA	M	H
ES4	E1	I	M	H	H	NA	H	NA
ES8	E5	I	L	H	H	NA	H	H
PALUSTRINE PROCESS GROUP								
PA1	L1	I	L	H	L	NA	M	M
PA2	L2	I	M	H	L	NA	M	L
PA3	L3	I	L	H	M	NA	H	NA
PA4	L4	I	L	H	M	NA	H	NA
PA5	L5	I	L	H	L	NA	M	NA
FLOOD PLAIN PROCESS GROUP								
FP1	C4	I	M	H	H	NA	M	L
FP2	C6	I	L	H	H	NA	M	M
FP3	B1	I	H	H	M	NA	M	M
FP4	C1	I	H	H	H	H	H	H
FP5	C3	I	H	H	H	NA	H	NA
GLACIAL OUTWASH PROCESS GROUP								
GO1	D8	I	M	L	H	NA	H	M
GO2	D4	I	M	L	M	L	M	NA
GO3	D5	I	M	L	H	NA	H	NA
GO4	D3	I or II	L	M	M	L	M	L
GO5	D1	III	NA	M	M	L	L	NA
ALLUVIAL FAN PROCESS GROUP								
AF1	B5	I	H	H	H	NA	H	H
AF2	A3	II	M	M	H	NA	H	L
AF8	D6	II or III	L	L	H	NA	H	NA
LARGE CONTAINED PROCESS GROUP								
LC1	C2	I	L	L	L	M	NA	L
LC2	C5	I or II	L	L	L	H	NA	L
MODERATE GRADIENT MIXED CONTROL PROCESS GROUP								
MM1	B2	I	M	M	M	L	M	H
MM2	B3	I	H	M	H	L	M	H
MODERATE GRADIENT CONTAINED PROCESS GROUP								
MC1	B4	I or II	L	L	L	L	NA	L
MC2	B6	I or II	M	L	L	M	NA	L
MC3	B7	II	L	L	L	H	NA	NA
HIGH GRADIENT CONTAINED PROCESS GROUP								
HC1	A6	II or III	L	L	L	L	NA	NA
HC2	A7	II or III	M	L	M	L	NA	L
HC3	A2	II	M	L	M	M-H	NA	L
HC4	A5	II or III	L	L	L	M	NA	L
HC5	A4	III	L	L	L	L	NA	NA
HC6	A1	III	M	L	M	H	NA	L
HC8	D7	III	L	L	L	M	NA	L
HC9	D2	III	L	L	M	M	NA	NA

- CHANNEL TYPE CODE: NEW=AFTER 9/91, OLD=PRIOR TO 9/91
- NA=NOT APPLICABLE, L=LOW, M=MODERATE, H=HIGH

APPENDIX C:
ALASKA REGION CHANNEL TYPE LEGEND

Estuarine Process Group

ES1 ..... Silt Substrate Estuarine Channel or Slough (E4)
ES2 ..... Narrow Small Substrate Estuarine Channel (E3)
ES3 ..... Narrow Large Substrate Estuarine Channel (E2)
ES4 ..... Large Estuarine Channel (E1)
ES8 ..... Broad Braided Glacial Outwash Estuarine Channel (E5)

Palustrine Process Group

PA1 ..... Narrow Placid Flow Channel (L1)
PA2 ..... Moderate Width Placid Flow Channel (L2)
PA3 ..... Shallow Groundwater Fed Slough (L4)
PA4 ..... Flood Plain Backwater Slough (L5)
PA5 ..... Beaver Dam/Pond Channel (L3)

Flood Plain Process Group

FP1 ..... Uplifted Beach Channel (C4)
FP2 ..... Foreland Uplifted Estuarine Channel (B8, C6)
FP3 ..... Narrow Low Gradient Flood Plain Channel (B1)
FP4 ..... Low Gradient Flood Plain Channel (C1)
FP5 ..... Wide Low Gradient Flood Plain Channel (C3)

Glacial Outwash Process Group

GO1..... Glacial Outwash Flood Plain Side Channel (D8)
GO2..... Large Meandering Glacial Outwash Channel (D4)
GO3..... Large Braided Glacial Outwash Channel (D5)
GO4..... Moderate Width Glacial Channel (D3)
GO5..... Cirque Channel (D1)

Alluvial Fan Process Group

AF1 ..... Moderate Gradient Alluvial Fan Channel (B5)
AF2 ..... High Gradient Alluvial Cone Channel (A3)
AF8 ..... Glacial Alluvial Cone Channel (D6)

Large Contained Process Group

LC1 ..... Low Gradient Contained Channel (C2)
LC2 ..... Moderate Gradient Contained Narrow Valley Channel (C5)

Moderate Gradient Mixed Control Process Group

MM1 ..... Narrow Mixed Control Channel (B2)
MM2 ..... Moderate Width Mixed Control Channel (B3)

APPENDIX C:
ALASKA REGION CHANNEL TYPE LEGEND

Moderate Gradient Contained Process Group

MC1 ..... Narrow Shallow Contained Channel (B4)
MC2 ..... Moderate Width and Incision, Contained Channel (B6)
MC3 ..... Deeply Incised Contained Channel (B7)

High Gradient Contained Process Group

HC1 ..... Shallowly Incised Muskeg Channel (A6)
HC2 ..... Shallowly to Moderately Incised Footslope Channel (A7)
HC3 ..... Deeply Incised Upper Valley Channel (A2)
HC4 ..... Deeply Incised Muskeg Channel (A5)
HC5 ..... Shallowly Incised Very High Gradient Channel (A4)
HC6 ..... Deeply Incised Mountainslope Channel (A1)
HC8 ..... Moderate/High Gradient Glacial Cascade Channel (D7)
HC9 ..... High Gradient Incised Glacial Torrent Channel (D2)

Notes:

1. Mapping Units for Lacustrine Process Group have not been defined to date. Lakes and large ponds are delineated in the GIS watershed cover and denoted with the symbol "L" in the GIS streams cover.

2. The following Process Groups were/are no longer valid as of 7/91:

    Uncontained Footslope Glacial Process Group

    Moderate Gradient Glacial Outwash Process Group

    Contained Mountainslope Glacial Process Group

3. Channel Type naming conventions:

Shallowly Incised..... = <5 m (16.5 ft)
Moderately Incised..... = 5-10 m (16.5-33 ft)
Deeply Incised..... = >10 m (33 ft)
Narrow width..... = <10 m (33 ft)
Moderate width..... = 10-20m (33-66 ft)
Wide..... = >20 m (66 ft)
Low Gradient..... = <2%
Moderate Gradient..... = 2-6%
High Gradient..... = 6-15% , Very High Gradient = >15%

4. The old Channel Type mapping symbols are shown in parenthesis (eg (B5)) following each CT name.

APPENDIX D:
FOREST WIDE CHANNEL TYPE SUMMARY

Individual Channel Types Reported as a Percentage of the Total Mapped Channels

On the Tongass National Forest

Estuarine Process Group

ES1 .....0.02%
ES2 .....1.00%
ES3 .....0.20%
ES4 .....1.00%
ES8 .....0.10%

Total: 2.32%

Palustrine Process Group

PA1 .....3.0%
PA2 .....0.3%
PA3 .....1.0%
PA4 .....0.2%
PA5 .....1.0%

Total: 5.5%

Flood Plain Process Group

FP1 .....0.2%
FP2 .....0.1%
FP3 .....5.0%
FP4 .....3.0%
FP5 .....2.0%

Total: 10.3%

Glacial Outwash Process Group

GO1 ..... < 1.0%
GO2 .....1.0%
GO3 .....1.0%
GO4 .....1.0%
GO5 .....0.2%

Total: < 4.2 %

Alluvial Fan Process Group

AF1 .....1.0%
AF2 .....2.0%
AF8 .....0.3%

Total: 3.3%

Large Contained Process Group

LC1 .....1.0%
LC2 .....1.0%

Total: 2.0%

APPENDIX D:
FOREST WIDE CHANNEL TYPE SUMMARY

Moderate Gradient Mixed Control Process Group

MM1 .....6.0%
MM2 .....3.0%

Total: 9.0%

Moderate Gradient Contained Process Group

MC1 .....4.0%
MC2 .....2.0%
MC3 .....1.0%

Total: 7.0%

High Gradient Contained Process Group

HC1 .....4.0%
HC2 .....2.0%
HC3 .....6.0%
HC4 .....3.0%
HC5 ..... 14.0%
HC6 ..... 25.0%
HC8 .....0.1%
HC9 .....4.0%

Total: 58.1%

Total may exceed 100 percent due to rounding.

- ☐ ES4l - LARGE SUBSTRATE PHASE have larger material, cobble/small boulder size range. Available spawning habitat is somewhat less than is typical for this channel type.
- ☐ ES4d - SAND DUNE PHASE are incised beach or sand dune channels found in coastal foreland areas. They are differentiated by the amount of glacial influence.
- ☐ PA1v - SCRUB FOREST PHASE: Riparian vegetation interspersed with patches of muskeg or shrub (Sitka alder and shore pine) plant communities.
- ☐ FP1f - FORESTED PHASE has a dominant Sitka spruce riparian vegetation component, however, willow/alder shrub species predominate along the channel margins. This vegetation pattern limits potential large woody debris recruitment to these streams.
- ☐ FP1s - SHRUB PHASE has extensive willow/alder shrub communities in the riparian zone.
- ☐ FP2f - FORESTED PHASE riparian vegetation has co-dominant spruce and nonforest plant communities. Inchannel large woody debris recruitment is a significant factor influencing fish rearing capability in some channel reaches.
- ☐ FP2s - NONFOREST PHASE riparian vegetation is dominantly shrub and muskeg bog plant communities.
- ☐ FP3a - VOLCANIC ASH PHASE is primarily restricted to Kruzof Island. Stream bank composition is influenced by poorly consolidated volcanic ash and breccias. Stream bank and sideslope sensitivity may be higher than is typical for this channel type.
- ☐ FP3m - MUSKEG VEGETATION/GRAVEL SUBSTRATE PHASE is characterized by muskeg/scrub forest riparian vegetation. Fish spawning and rearing habitat capabilities may be lower than is typical for this channel type.
- ☐ FP3f - FORELAND OUTWASH FORESTED PHASE is influenced significantly by groundwater influx from shallow alluvial aquifers. Fish habitat capability may be higher than is typical for this channel type due to temperature moderation by groundwater.
- ☐ FP3s - FORELAND OUTWASH SHRUB PHASE is significantly influenced by groundwater inflow. Rearing habitat capability may be less than FP3f (FORELAND OUTWASH FORESTED PHASE) due to a lack of large woody debris input, and, as a consequence, less pool structure and cover habitat.
- ☐ FP4a - VOLCANIC ASH PHASE is limited geographically to drainage basins heavily affected by geologically recent volcanic deposits. Stream bank and substrate composition is predominantly scoria and ash particles deposited by multiple volcanic eruptions.
- ☐ FP4l - LARGE SUBSTRATE PHASE has greater stream power than a typical FP4 channel, thus functioning as a more efficient sediment transporter. Substrate usually is somewhat larger, and large woody debris has less influence on channel dynamics.
- ☐ FP4m - MUSKEG PHASE is typified by low gradient, muskeg or meadow channels. However, significant fine gravel, sand, and silt deposition and transport occur in this phase, making these channels more similar to the Flood Plain Process Group versus those channels categorized in the Palustrine Process Group.
- ☐ FP4f - FORELAND, OUTWASH, FORESTED PHASE includes alluvial flood plain channels that are set apart by predominant groundwater recharge. This phase is restricted to coastal foreland landforms with early successional Sitka spruce riparian stands.

- ☐ FP4s - FORELAND, OUTWASH, SHRUB PHASE includes foreland groundwater streams with shrub or muskeg riparian vegetation.
- ☐ FP5l - LARGE SUBSTRATE PHASE has greater stream power than the typical FP5 and is a more efficient sediment transport system. Substrate has a larger mean diameter than in the typical FP5 channel.
- ☐ FP5m - MUSKEG PHASE includes riparian vegetation consisting of muskeg and meadow interspersed with individual trees and some forest. This is an alluvial channel with significantly greater sediment transport than Palustrine Process Group channels that often have similar riparian plant communities.
- ☐ FP5f - FORELAND OUTWASH FORESTED PHASE are alluvial channels that are strongly influenced by groundwater recharge from shallow aquifers. This phase is restricted to coastal foreland landforms. Sitka spruce communities dominate the riparian vegetation.
- ☐ FP5s - FORELAND OUTWASH SHRUB PHASE are groundwater fed, coastal foreland channels, with predominantly nonforested riparian plant communities.
- ☐ FP5b - BEDROCK INFLUENCE PHASE have mixed bank control associated with occasional bedrock outcrops.
- ☐ AF2s - SHRUB PHASE consists primarily of brush riparian vegetation.
- ☐ AF8s - SHRUB PHASE consists primarily of brush riparian vegetation.
- ☐ LC1g - GLIDE PHASE has consistently lower gradient stream reaches than is typical for LC1 channels. This phase tends to occur where channel base level is controlled by a downstream feature such as resistant bedrock outcrops or a lake inlet or outlet.
- ☐ LC1r - MORAINE PHASE has bank control from glacial moraine deposits. Stream substrate has a larger boulder component, and sideslope stability may be lower than is typical for LC1 channels.
- ☐ MM1s - SHRUB PHASE is typically situated in the upper valley reaches of a watershed. Snow avalanche slopes are proximal to this channel. Riparian vegetation consists of brush species (Sitka alder and willow). Rearing capability for this phase is less than is typical for this channel type due to a lack of rearing habitat associated with large wood.
- ☐ MM2s - SHRUB PHASE is typically adjacent to steep mountainslopes subject to extensive snow avalanche activity. Riparian vegetation consists mainly of disturbance vegetation, alder and salmonberry. Large woody debris volume is comparatively low in this phase, therefore, fish capability may be lower.
- ☐ MM2m - MUSKEG PHASE is typically associated with glacially scoured lowland landforms. Riparian vegetation consists of mixed conifer scrub forest and muskeg bog species.
- ☐ MC1m - MUSKEG PHASE is typically a high energy system with muskeg bog and shrub riparian vegetation. Fish habitat associated with large woody debris may be less in this phase than is typical for MC1 channel types.
- ☐ HC2s - SHRUB PHASE consists primarily of brush vegetation.

TYPICAL DISTRIBUTION OF CHANNEL PROCESS GROUPS WITHIN ALEXANDER ARCHIPELAGO WATERSHEDS